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User’s Guide

Earth Observing System (EOS)
Data and Information System (EOSDIS) Test System (ETS)
Multimode Portable Simulator (MPS)
Release 1.6.0

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Contents

List of Figures

List of Tables

1 – Introduction

1.1 Purpose and Scope

This document provides guidance for using the Earth Observing System (EOS) Data and Information System (EOSDIS) Test System (ETS) Multimode Portable Simulator (MPS).

Note: The MPS is no longer required to support the Nascom block formats to simulate the contingency network interface. Please disregard the sections of this User's Guide that deal with Nascom block formats. For an explanation, see the note in Section 2.1.

1.2 Document Organization

This user's guide comprises two sections: Section 1 gives an introduction, and Section 2 describes the use of the MPS. Section 2 includes information on how to set up and start the software, what the MPS operational procedures are (what functions to perform and in what order, to accomplish specific objectives), and how to use each of the functions (dialog boxes). (Note: MPS comes with several utilities, whose operations are described in the appendices to this User's Guide.)

1.3 Assumptions and Conventions

This user's guide assumes that you have a basic familiarity with graphical user interfaces (GUIs) such as OSF/Motif, Macintosh, and Microsoft Windows.

This user's guide assumes that a standard mouse will be used as the pointing device for controlling the interaction via the MPS GUI. The information in this user's guide applies to any pointing device (e.g., track ball, arrow keypad) that will work with a UNIX workstation in an equivalent way.

The rest of this section explains the conventions that this user's guide uses to explain MPS operation, and those that the MPS user interface itself uses.

1.3.1 User's Guide Conventions

To indicate and represent certain kinds of MPS user interface objects in the text, this user's guide uses the following conventions:

- Text that you should enter appears in the `Courier` typeface, with quotation marks around it. (Do not type the quotation marks.)
- *Pull-down menu options* appear in italic.
- **Pushbutton, radio button, and check button names** appear in boldface type.

- “Click on” a GUI object means position the pointer (usually an arrow) over that object, and press and release the left mouse button, without moving the mouse.

1.3.2 Overall Style

MPS user interface objects that are standard OSF/Motif objects have the look and feel as described in the *OSF/Motif Style Guide* (MSG), version 1.2. This section describes some of these specifics.

MPS includes some other kinds of user interface objects that are not described in MSG. These have the look and feel of analogous objects in Microsoft (MS) Windows 95. An example is a list field — a combination of an editable text field, a down-arrow pushbutton, and a popup list. (The list field resembles Windows’ combination box — e.g., the MS Word font selector is a combination box.)

1.3.3 General Conventions

The title of a window or dialog box identifies the user task that the window or dialog box supports, and it may also identify the primary action and specific focus of that user task.

An ellipsis (“...”) at the end of a menu option name or pushbutton label indicates that additional information is needed for completion of the action that the option or pushbutton invokes. A dialog box will appear to collect that information.

A highlighted border surrounding an object (e.g., a text field or pushbutton) indicates that the object has keyboard focus, and that any key(s) you press will apply to that object. For example, if a pushbutton has keyboard focus, pressing the “Enter” key will activate that pushbutton. For another example, if a text field has keyboard focus, anything you type will go into that field (except that the “Enter” key has the behavior described above).

Any object that may be accessible or “clickable” under some conditions is “grayed out” or “dim” under conditions in which it is not accessible.

1.3.4 Dialog Boxes

1.3.4.1 Primary dialog boxes

Most MPS dialog boxes are used for specifying and controlling the activities of the MPS — i.e., for performing an MPS user task. Almost all of these have three pushbuttons:

- **OK** accepts all input and changes, and closes the dialog box. Any actions you have specified in the dialog are executed.
- **Cancel** closes the dialog box without accepting any input or changes (unless you have **Applied** or **Set** them; see Section 1.3.4.2). **Cancel** does not execute the task or any actions that you may have specified in the dialog.
- **Help** initiates the display of information about how to use the task dialog box (and any

relevant subordinate dialog boxes).

The Command Validation dialog box (Figure 2-34) and the Monitor Parameter dialog box (Figure 2-47) are examples of primary dialog boxes.

1.3.4.2 Multiple modification dialog boxes

Some dialog boxes allow for modifications of many of the same type of item. Where it is practical, all items are displayed at the same time for editing. If there are too many items (e.g., Telemetry Packet Configuration, Figure 2-39), they have one or more **Apply** pushbuttons. **Apply** causes the action to happen immediately, where **Set** simply saves the information and is not actually applied until you click on **OK**.

1.3.4.3 Confirmation dialog boxes

Some user actions must be confirmed before MPS will execute them. For these actions, a Confirmation dialog box (Figure 1-1) appears when you initiate the action.

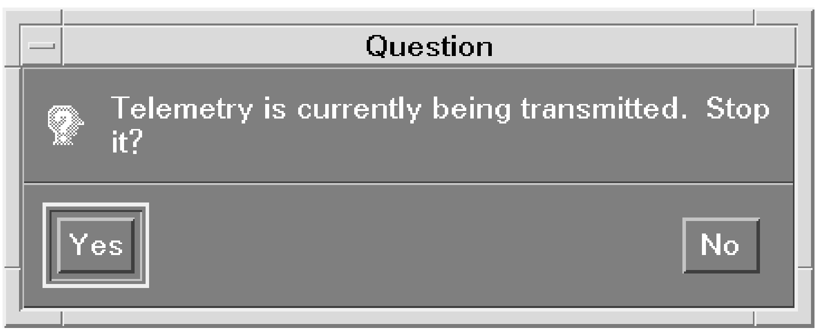


Figure 1-1. Confirmation Dialog Box

Confirmation dialog boxes have **Yes** and **No** pushbuttons. To execute the action and close the confirmation dialog box, click on **Yes**. If the action was initiated via a click on the task dialog box's **OK** pushbutton, the task dialog box is also closed. To close the confirmation dialog box and return to the task dialog box without executing the action, click on **No**.

1.3.4.4 Prompt dialog boxes

A prompt dialog box (Figure 1-2) is used to request more information.

Type the requested information into the field provided. To use that information, click on **OK**. To cancel the action and avoid entering the information, click on **Cancel**.

1.3.4.5 File selection dialog boxes

A file selection box (Figure 1-3) is used to select files for opening, saving, printing, and other MPS task activities. Most of the file selection boxes have the name of the activity included in the title.

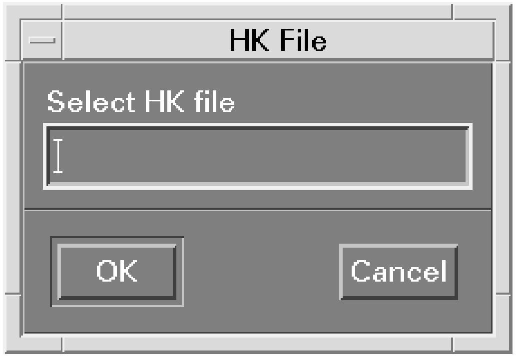


Figure 1-2. Prompt Dialog Box

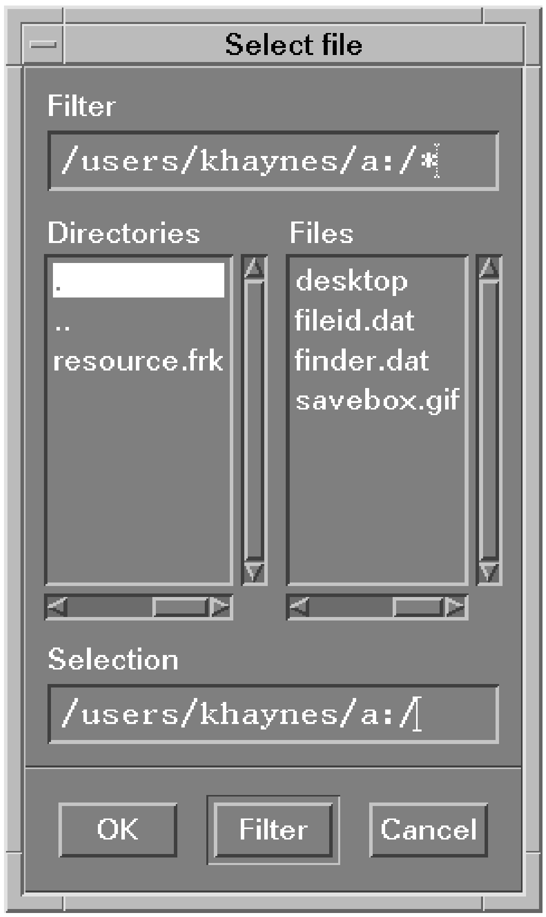


Figure 1-3. File Selection Dialog Box

The File filter (e.g. "/users/khaynes/a:*") appears in the field labeled "Filter" at the top of the dialog box. (A wildcard "*" indicates that all files are listed.) The "Directories" section lists the directories below the directory shown in the "Filter" field. (Access to a directory is limited to authorized users of that directory.) The "File" section lists all files in the directory that match the file filter.

To change the filter and list only some of the files in a directory, just edit the “Filter” field and click on the **Filter** pushbutton. The “Directories” and “Files” list boxes change to reflect the new filter.

To see files in a different directory, click on the desired name in the “Directories” section. To see the contents of the directory that is one level above the current directory, click on the “..” line. (A single dot [“.”] is the UNIX way of indicating the current directory; clicking on it will just redisplay the directory information that you already see.) The “Filter” text field changes to reflect the new directory, and the “Files” section changes to show the files that are in the selected directory. The “Directories” section also changes to show the subdirectories of the selected directory.

To select a file and use it in the MPS task activity, either double-click on the filename or click on the filename (which will then appear in the “Selection” text area) and then click on **OK**. To close the file selection box without selecting a file, click on **Cancel**.

1.3.4.6 Display-only dialog boxes

Some dialog boxes are used for display only, rather than control or data entry. These dialog boxes have only a **Close** button (instead of **OK**, **Apply**, or **Cancel**) because there are no entries, changes, or actions to accept, execute, or cancel.

The information dialog box (Figure 1-4) is an example of a display-only dialog box. Another example is each of the monitor dialog boxes (Section 2.4.5.1).

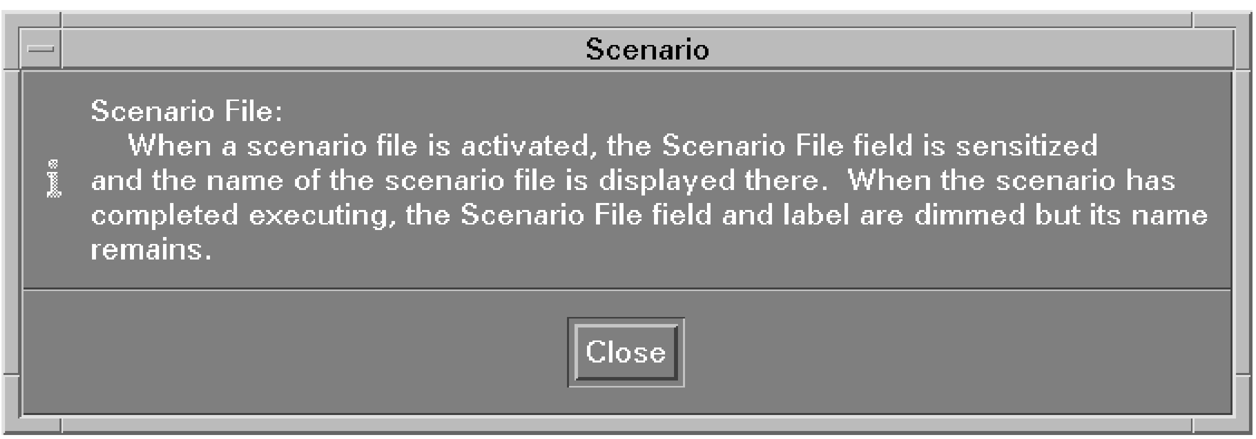


Figure 1-4. Display-only Dialog Box

To close the dialog box and continue with the task, click on **Close**.

1.3.5 Pull-Down Menus

Some actions that are accessible via menu options also have accelerators. These are keyboard key combinations that let you activate these options without using the mouse or having the menu displayed. The accelerator for an option is shown to the right of the option’s name in the menu.

Every menu title and many menu options have one character underlined. This character is called the "mnemonic" (memory aid) for that menu or menu option. A mnemonic allows access to that menu and menu option via the keyboard. A right-pointing arrow ( ) at the end of a menu option indicates that a cascade menu (a submenu) will appear for selecting more details under that option.

1.3.6 Other Controls

1.3.6.1 Check buttons

A check button represents an individual option that can be either selected or not selected (either "on" or "off"). A check button has a label with a square to the left, which appears raised (Figure 1-5a) when the option is not selected ("off") and appears darkened and recessed (Figure 1-5b) when the option is selected ("on").

a - Unselected **b - Selected**

Figure 1-5. Check Buttons

Check buttons may exist individually or in a group, according to their meanings, but they are always independent from one another (i.e., selecting or deselecting one has no effect on any of the others). A check button may appear in a window, dialog box, or pull-down menu. To select a check button, click on either the square or the label.

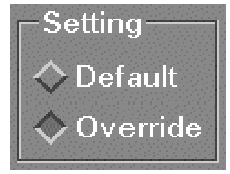
1.3.6.2 Radio buttons

A radio button group (Figure 1-6) represents a set of mutually exclusive options — i.e., only one of the options can be "on" at any one time, and selecting one of the radio buttons in a group automatically deselects the radio button that was selected beforehand. Each radio button has a label with a diamond to the left, which appears darkened and recessed when that particular option is selected. A radio button group may appear in a window, dialog box, or pull-down menu, and (except in a menu) may be aligned horizontally (Figure 1-6a) or vertically (Figure 1-6b). To select a radio button, click on either the diamond or the label.

1.3.6.3 Text fields

Text fields may be editable or not. Editable text fields (Figure 1-7a) appear recessed, and a text insertion cursor (an "I-beam") is visible within the field to show where the typed text will appear. Text fields that cannot be edited (Figure 1-7b) do not appear recessed (although they may have a rectangular border), and they do not contain a text insertion cursor.

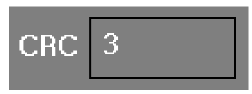
a - Horizontal



b - Vertical

Figure 1-6. Radio Buttons

a - Editable



b - Non-Editable

Figure 1-7. Text Fields

1.3.6.4 Spinners

A spinner (Figure 1-8) allows you the option of setting a value either by typing it into a text field or by clicking on up or down arrow pushbuttons to increase or decrease the value shown in the text field (usually ±1 for each click).

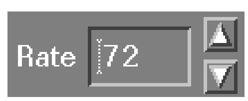


Figure 1-8. Spinner

1.3.6.5 List Fields

A list field (Figure 1-9) is a combination of a label, a text field, a list box, and a down-arrow pushbutton. You may type a value into the text field or select an item from the list. To activate the list, click on the down-arrow pushbutton. A list box showing the valid entries will appear below the field, and the pushbutton will change to an up arrow. To select one of the items, click on that item; to remove the list without changing the selected item, click on the up-arrow pushbutton.

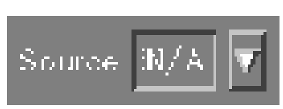


Figure 1-9. List Field

2 – Multimode Portable Simulator (MPS)

2.1 MPS Introduction

MPS is a low-fidelity EOS-AM1 spacecraft simulator developed by GSFC Code 513, the Test and Verification Branch, to support test requirements of the Earth Sciences Data and Information System (ESDIS) Project. MPS builds on legacy portable spacecraft simulator (PSS) systems and provides a capability to test low-rate forward- and return-link interfaces to the EOS Data and Operations System (EDOS) and the EOS Operations Center (EOC). It simulates a subset of the spacecraft command and data handling (C&DH) functions (including command validation, stored command processing, and telemetry formatting) and simulates selected telemetry parameters. MPS receives and verifies commands according to the Command Operations Procedure (COP-1) protocol. It generates the basic S-band spacecraft telemetry data formats, including housekeeping, health and safety, diagnostic, and playback data formats.

MPS operates in three data format modes for different purposes:

- Serial spacecraft data for nominal Space Network (SN) operations
- 4800-bit blocks for contingency network operations [Ground Network (GN), Deep Space Network (DSN), Wallops Ground System (WGS)]
- EDOS formats (e.g., EDUs and command data blocks) for testing the EOC directly, without the involvement of EDOS

The MPS is portable and can support ground network testing from various test sites.

Note: The MPS was originally required to support the Nascom 4800-bit block format, which was being used at the time for the EOS contingency mode interface. The EOS requirement for handling Nascom blocks was dropped when EOS polar ground stations (EPGS) were selected to replace the NASA ground stations (GN, DSN, and WGS) for EOS-AM1 contingency support. The EPGS data format does not differ from the Space Network serial data format; only the clock rates are different. As a result, the MPS is no longer required to support the Nascom block formats to simulate the contingency network interface. The MPS software and User's Guide were not revised to remove this artifact of the earlier ground system architecture because of the significant effort with little value added at this time. Please disregard the sections of this User's Guide that deal with Nascom block formats.

2.1.1 MPS Functional Summary

MPS has the following functions:

- Generate and transmit low-rate spacecraft data as CADUs in serial bitstream (for input to

EDOS), as CADUs in Nascom 4800-bit blocks (for input to EBnet as if from a contingency site), and as packets in EDOS data units (EDUs) (for input to the EOC)

- Receive and verify spacecraft commands as serial bitstream forward link data, CLTUs in 4800-bit blocks, or in EOC-EDOS command data blocks
- Use AM-1 project data base (PDB) to generate telemetry and verify commands
- Update telemetry verifiers in real time in response to valid spacecraft commands
- Simulate EOS-AM1 low-rate data formats, including housekeeping, health and safety, diagnostic and dump
- Simulate two return-link channels simultaneously
- Simulate EDOS rate buffered data file transfers to EOC using MPS-generated data
- Simulate EDOS service header and ground message header fields

2.1.2 MPS Operational Summary

Use of the MPS involves activities in three phases of operation. These phases and typical user activities include:

- Pretest preparation: Set up files used by the MPS during test execution:
  - One-time files: binary files for modeling functions, or a file containing Internet Protocol (IP) addresses and User Datagram Protocol (UDP) port numbers for testing with the EOC
  - PDB-related files: PDB files internal to MPS (generated by an offline utility when new versions of the PDB are received)
  - Test-specific files: scenario files or activity log files that are accessed during a testing session to control some aspects of the test or the data generation process (created with a text editor)
- Test execution: Configure, control, and monitor MPS during a test:
  - Configure MPS for telemetry transmission and command reception
  - Monitor data quality and accounting displays
  - Control data logging, CODA simulations, and scenario file execution
  - Inject errors, set telemetry parameter values, and establish modeling associations

  Test execution forms the bulk of MPS task activities, and this user's guide focuses on them.
- Posttest analysis: Support analysis activities after a test:
  - View command or telemetry log files or the system log file

- Capture screen images of final summary display windows

2.1.3 MPS Definitions

CADU — channel access data unit. A CADU is a VCDU that contains the Reed-Solomon error control check symbols and is prefixed with a fixed 32-bit synchronization marker (1ACFFC1D hexadecimal). MPS uses this format for telemetry when it is operating in spacecraft simulation mode.

CLCW — command link control word. A CLCW is the primary mechanism on the spacecraft for reporting command transfer status and verification to the EOC. In spacecraft simulation mode, MPS reports CLCWs in CADUs containing real-time data formats. In EDOS simulation mode, MPS transmits a separate stream of EDUs containing CLCWs when real-time telemetry is active.

Configuration — the combined set of states of the elements of the MPS simulator

EDU — EDOS data unit. A simulated EDOS data product, an EDU is a complete CCSDS packet with the EDOS service hader attached, which contains quality and accounting indicators and whose format is specified in the Interface Control Document Between EDOS and the EOS Ground System (EGS) Elements (EDOS-EGS ICD). MPS generates and transmits EDUs when operating in EDOS simulation mode.

HSIO card — high-speed input/output card. The HSIO card is a device used for transmitting telemetry and receiving commands when MPS is operating in spacecraft simulation mode.

RB file — rate-buffered file. A simulated EDOS data product, an RB file is a file of EDUs containing low-rate playback housekeeping data. An RB file is transmitted via ftp to the EOC when the MPS is operating in EDOS simulation mode.

Scenario — simulated conditions of the spacecraft based on values of telemetry parameters

Simulation mode — the mode in which the MPS simulator is operating; i.e., whether it is simulating the EOS spacecraft or EDOS

Transmission mode — data transmission format. This format is either serial (SN) or blocked (DSN,GN,WGS Nascom blocks) modes when MPS in operating in spacecraft simulation mode.

VCDU — virtual channel data unit. A VCDU is a fixed-length CCSCS Advanced Orbiting System data structure that is used bidirectionally for space/ground communications. The VCDU format is specified in the Interface Control Document Data Format Control Book for EOS-AM1 Spacecraft (ICD-106).

2.1.4 MPS Setup

2.1.4.1 Hardware Configuration

The MPS has two hardware components: an MVME-187 with the UNIX operating system, and an MVME-177 with PDOS operating system. The MVME-187 is the front-end component that provides the user interface and hosts the OMDSIM and other support software. The MVME-177 is the back-end component that hosts the spacecraft simulator functions.

The MPS front-end component consists of a notebook PC networked with an external component contained in the simulator platform chassis. The front end has the following elements:

- Pentium-based notebook PC running at 90 MHz with 16 MB of memory
- 520 MB removable hard drive
- 640x840 active matrix color display
- serial and parallel ports
- mouse pointing device
- Ethernet (thin net) card

The external component contained in the simulator platform chassis consists of a Motorola RISC single-board VME-based computer (an MVME-187-003B card hosting a MC68040, 25MHz microprocessor with 16 MB memory), TVME712-E transition module/Ethernet transceiver, 1GB hard drive, and streamer tape drive. The single-board computer supports the UNIX System V operating system. The notebook PC monitor is planned for portability, but an X terminal can be used when the MPS is operating at its home facility.

The simulator platform consists of a collection of 6U cards that occupy single slots within a VME chassis. The simulator platform is composed of a Motorola MVME-177-004 card (hosting an MC68060 microprocessor and an Ethernet controller); four AVTEC High-Speed Input/Output (HSIO) cards; one Frame Synchronization Input/Output (FSIO) card; one PC Synchronizable Time Generator card; a 64MB DRAM; a 1GB Hard Disk Drive; a 3.5", 1.44MB floppy disk drive; a 4mm cartridge tape unit; and a bubble jet printer. The MVME-177 runs under the PDOS operating system.

2.1.4.2 MPS Software Configuration

The MPS has two software components:

- MPS user interface (MPS Executive)
- Spacecraft simulation

The spacecraft simulation component executes on the MVME-177 main processor, and the user interface executes on the MVME-187-based computer that is part of the MPS front end.

2.1.4.3 MPS Files and Environment Variables

MPS depends on a number of environment variables, predefined files, and system files (including PDB files, network IP address files, and UDP port files).

A number of environment variables must be set for MPS. Table 2-1 shows these variables and their expected values:

MPS Environment Variable	Expected Value
Menu controller variables	
ETS_ICON_FILE	$ETS_RUN_ROOT/runtime/mmc_sample_icon_file
ETS_TEMP_DIR	$ETS_RUN_ROOT/runtime/temp
ETS execution variables	
ETS_HELP_DIR	$ETS_RUN_ROOT/runtime/help
ETS_LOG_DIR	$ETS_RUN_ROOT/runtime/log
ETS_OMD_DIR	$ETS_RUN_ROOT/runtime/omd
ETS_PARAMS_DIR	$ETS_RUN_ROOT/runtime/params
ETS_PROC_LOG_DIR	$ETS_RUN_ROOT/runtime/event_log
ETS_SCN_DIR	$ETS_RUN_ROOT/runtime/scenario
MPS variables	
MPSSIM_ACTIVITY_LOG_DIR	$ETS_PROC_LOG_DIR
MPSSIM_ACTIVITY_EXT	.activity
MPSSIM_HK_EXT	.hk
MPSSIM_HOSTNAME	m177
MPSSIM_PORTNAME	1100
MUI_INIT_PARAMS	mui_init_params
OMDSIM_HOSTNAME	m177
OMDSIM-PORTNAME	2100

Table 2-1. MPS Environment Variables and their Expected Values

Another cluster of files needed during MPS operation is set up for you. Generally, you will not need to change these files except when there are updates to the PDB or when IP addresses or UDP port numbers change for the given MPS configuration (see Sections 2.3.1.1 to 2.3.1.3).

User (predefined) files include configuration files and scenario files. You can use configuration files to save several session setup parameters that reflect how you typically initialize MPS for operations (see Sections 2.4.2.1 to 2.4.2.3). Scenario files are a useful way to set telemetry parameters to specified values at set times following the scenario start time (see Section 2.4.3.3).

In addition to these input files, MPS also generates a number of output files. MPS always creates a new session log file when the MPS user interface component starts. Its name is <timestamp>.mps_log, where <timestamp> is the start time of the MPS user interface component. Every entry that appears in the status log area of the MPS main window is stamped with its time of occurrence and is entered into the session log.

In addition, you have the option to create other output log files containing received commands or transmitted telemetry for analysis, for example. Procedures for creating these log files are described in Sections 2.4.3.6 and 2.4.3.7.

2.1.4.4 Starting MPS

There are two MPS units: MPS#1 and MPS#2. The following starting and stopping procedures are identical for these systems, except as noted.

Start the MPS computers from a cold state as follows:

1) Turn on the consoles for the MVME-187 and the MVME-177.
2) Turn the power switch on the MVME chassis to the “on” position.
3) On the MVME-187 console, enter “`bo 0`” from the keyboard to boot up the MVME-187 processor. Wait for the console login prompt.
4) The MVME-177 processor will boot automatically. Wait for the PDOS prompt “10:/>”.

Start the MPS simulator as follows:

From the MPS X terminal:

- 1a) From the list of available options, select “ets2” for MPS#1 or “ets” for MPS#2. This will bring up a login screen on the X terminal.

From the laptop:

- 1a) Turn on the MPS laptop. Wait for Windows to initialize.
- 1b) If the “Welcome to Windows for Workgroups” dialog box appears, click on **Cancel**.
- 1c) Double-click on the “eXceed” icon. This will bring up an X terminal window and a login screen on the laptop.

2) Start the session by logging in. Use the login userid and password supplied to you by the system administrator.

3) In the X Window System terminal window on the laptop or X terminal, click the **MPS** button in the Menu Controller (see section 2.1.5). (Alternatively, you could enter the command "`mps`" or "`ets_mps`" to bring up the MPS user interface software, but it is recommended that you use the Menu Controller exclusively because the environment is established automatically.) (**Note:** If, when you are trying to start the Menu Controller, a displayed message indicates that the Menu Controller is already in use, it may be due to an abnormal termination from a previous session. Rather than rebooting the system, you may need to bypass the Menu Controller and start the MPS directly, by entering the command "`mps &`", which runs the MPS application in background.)

4) On the MVME, reset the MVME-177 board and the HSIO boards. This will flush any data buffers. (Note: Whenever you reset the the MVME-177, you must also reset the HSIOs.)

5) On the MVME-177 console, change to the directory containing MPS. Your system administrator will supply you with this directory name.

6) After the MPS main window (Figure 2-4) appears, type "`RUN_MPS <directory of current PDB>`" on the MVME-177 console to initiate the MPS VME executables.

7) On the MVME-177 console, a series of messages that report initial configuration settings, such as time and the HSIO board settings, are displayed.

8) Wait for the message "MPS_CONFIG_PKT_FMT" to appear on the MVME-177 console and the "MPS Release 1.6.0 ready for operations" to appear in the status log area of the MPS main window before using any MPS functions via the MPS main window.

On startup, MPS reads an initial execution parameters file that contains default values for the configuration and mode parameters that you can set. You can override these default values by opening a configuration file (see Section 2.4.2.1) or by entering specific values for the parameters via the various MPS windows and dialog boxes, and you can save such values for later use as a configuration file (see Sections 2.4.2.2 and 2.4.2.3). The initial execution parameters file, whose name is specified in the UNIX environment variable MUI_INIT_PARAMS, cannot be modified or overwritten unless you use the UNIX "chmod" command to allow it to be overwritten.

Also on startup, MPS displays the version number of the selected PDB and modeling data base in the status log area of the MPS main window. It displays a warning message if any data base file has a different version number.

MPS automatically sets the initial values of the telemetry parameters to the midpoints of their respective ranges (see Appendix A). In some cases, these settings may produce errors in some discrete parameters. To correct these errors, or to use initial values other than the midpoints, create a scenario file that is executed directly after MPS startup (see Appendix D).

2.1.4.5 Stopping MPS

The shutdown procedure for the MPS (simulator, user interface, and computers) to a cold state is as follows:

First, stop the MPS simulator and user interface:

1) Enter "`clear`" from the MVME-177 console.
2) Select the *Exit* option from the MPS File menu on the MVME-187.
3) Enter "exit" to exit from the X terminal window.
4) (If using the laptop) Close the "eXceed" window.
   OR
   (If using an X terminal) Exit the X Window System session.

Next, if necessary, shut down the computers:

> **Note**: This is not a normal or even a daily procedure. The MVME-187 needs to be powered down *only* when it is to be moved physically or in the rare event of an MPS crash in which the MVME-187–to–MVME-177 TCP socket connection has become locked and will not clear through any other means.

Perform steps 1 to 8 at the MVME-187 console. (When the following instructions say to "enter" something, type the text, without quotation marks, and press the "Return" key.)

1) Log in to the MVME-187 console using the account name "powerdown" and password "powerdown".
2) Several messages will be displayed, ending with a request for your terminal type. Enter "`VT100`" (type `VT100` — no quotation marks — and press the "Return" key).
3) Hold down the Shift key and press the "Previous" key. The "Previous" key is to the right of the "Return" key and is labelled prev PAGE next .
4) Enter "`cont`".
5) When the request "time until shutdown" appears, enter "`0`".
6) Hold down the Shift key and press the "Previous" key.
7) Enter "`save`".
8) A number of messages will appear, ending with "System secure for powerdown..." (Ignore the "Console Login" request.)

For a complete MPS power down, turn off the power at the MVME chassis and on the consoles for the MVME-177 and MVME-187 boards. If the laptop is in use, exit Windows and turn off the power.

If you are recovering from an MPS crash, reset the MVME-187 by pressing the red reset button on the leftmost board. (**NOTE**: THIS RESETS EVERYTHING IN THE CASE.) When ready to reboot the MVME-187, turn on the power, if necessary, then enter "`bo 0`" at the MVME-187 console.

2.1.4.6 MPS IP Addresses

The IP addresses of the various MPS components are changeable, as are the multicast data IP addresses. To get the current addresses of the equipment you are using, contact the MPS System Administrator.

2.1.5 ETS Menu Controller

2.1.5.1 Starting Up the ETS MPS Menu Controller

To start the Menu Controller for the ETS Multimode Portable Simulator, enter "`ets_mps`" at the login prompt. The ETS MPS Menu Controller Window (Figure 2-1) will appear:

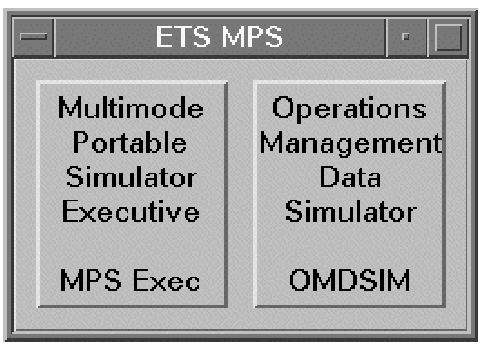


Figure 2-1. ETS MPS Menu Controller Window

The pushbuttons in the ETS MPS Menu Controller window represent the ETS applications that can be executed on the Multimode Portable Simulator system.

2.1.5.2 Starting an ETS Application

To start an ETS application that is inactive, click on the pushbutton for that application.

Note: ETS applications are initially inactive and must be started when this window first appears.

Note: If you try to start an application that is already active, ETS will interpret the pushbutton click as a command to terminate the application. To recover, cancel the termination (see section 2.1.5.3 for details).

2.1.5.3 Terminating an ETS Application

To stop an ETS application that is active, click on the pushbutton for that application. Clicking on the button of an active application starts its termination sequence. A question dialog box (Figure 2-2) appears, to ask you to confirm the termination.

To terminate the application, click on **Yes**. To cancel the termination and leave the application active, click on **Cancel**.

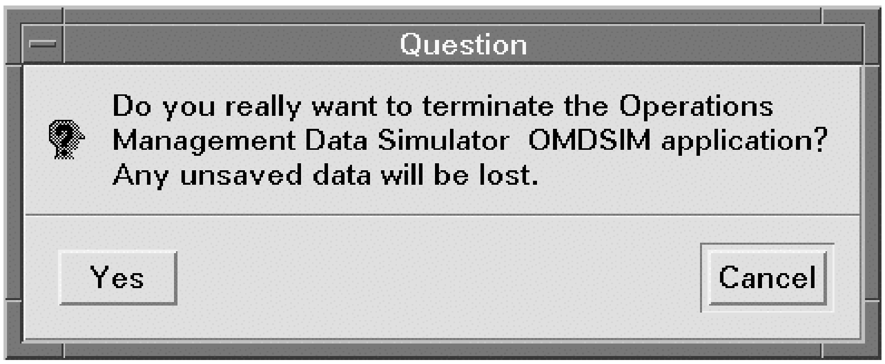


Figure 2-2. ETS MPS Application Termination Confirmation Dialog Box

Note: If you try to terminate an application that is not active, ETS will interpret the pushbutton click as a command to start the application. To recover, click again on the application's pushbutton in the Menu Controller window and follow the above instructions for termination.

Warning: Terminating applications via the Menu Controller is a shortcut. An application terminated in this way does not have the opportunity to ask you about saving any data or files. For a safer alternative, select the *Exit* option from the File menu of the application's main window. Alternatively, you may bypass the Menu Controller by invoking MPS directly and running it in the background. To do this, enter "MPS&" at the UNIX command line prompt.

2.1.5.4 Shutting Down the ETS Menu Controller

To shut down the ETS MPS Menu Controller and any active applications, select the *Close* option from the window menu of the Menu Controller window. (To bring up the window menu for any window, click on the square with a bar in it, in the upper left corner of the window.) If no applications are active, the window will be closed immediately and the Menu Controller terminated.

If there are active applications, the ETS MPS Menu Controller Shutdown Confirmation dialog box (Figure 2-3) will appear to request confirmation of the termination.

To continue the ETS MPS shutdown, click on **Yes**. All active applications will be terminated as if you had requested *and confirmed* their termination through the Menu Controller. To cancel the shutdown and leave the application(s) active, click on **Cancel**.

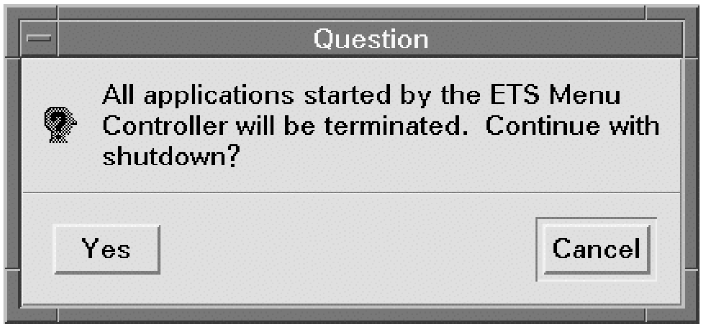


Figure 2-3. ETS MPS Menu Controller Shutdown Confirmation Dialog Box

Warning: Terminating applications in this way is a shortcut. An application terminated in this way does not have the opportunity to ask you about saving any data or files. For a safer alternative, select the *Exit* option from the File menu of the application's main window. Alternatively, you may bypass the Menu Controller by invoking MPS directly and running it in the background. To do this, enter "MPS&" at the UNIX command line prompt.

2.2 MPS Operational Overview

This section briefly describes the functions of the MPS main window and pull-down menus. For information on what functions to use for what purposes, see Section 2.3. For information on how to use these functions, see Section 2.4.

2.2.1 MPS Main Window

When you start MPS, the main window (Figure 2-4) appears. The MPS main window provides access to MPS functions and presents status messages and important configuration information.

The MPS main window provides some important information about the MPS configuration and operation:

- <u>Spacecraft time</u> is the time used to timetag telemetry packets.
- <u>UTC</u> is used to timestamp blocked transmission of CADUs.
- <u>Scenario File</u> reflects whether a scenario is being executed. If so, the filename of the scenario is displayed.
- <u>Simulation Mode</u> reflects whether MPS is simulating EDOS or the EOS spacecraft:
  - EDOS: direct communication with EOC in EDOS formats using network protocols.
  - Spacecraft: communication with EDOS as if through the Space Network (SN) or the contingency Ground Network (GN).
- <u>Data Source</u> indicates the source to be used for simulating telemetry data — either a housekeeping (HK) data file, or the EOS-AM1 project data base (PDB).

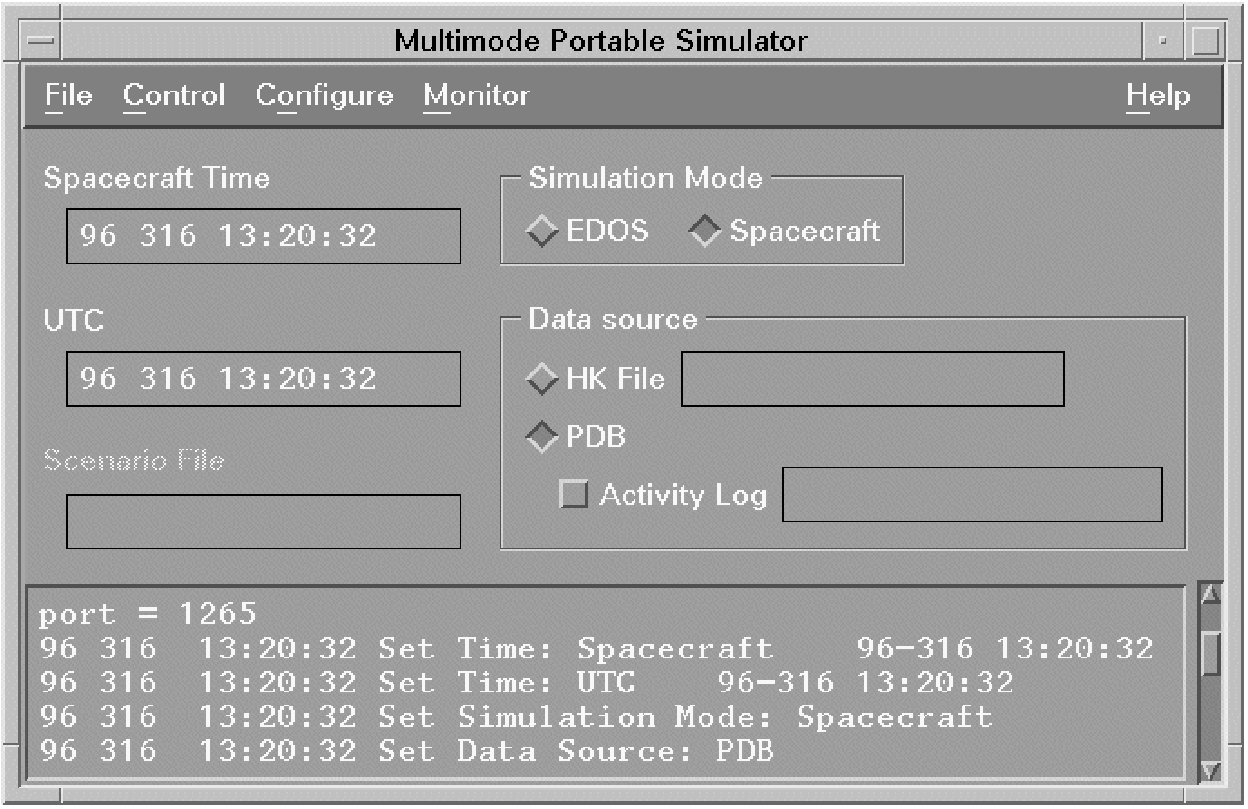


Figure 2-4. MPS Main Window

- The status log area at the bottom includes process status, command directives, and errors. Every entry in the log is stamped with the time of its occurrence, and is appended to the status log file. Most MPS functions generate at least one status message, of which the first is an acknowledgment of the requested function. Subsequent status messages indicate the success or failure of the function.

2.2.2 MPS Menus

2.2.2.1 MPS File Menu

The MPS File menu (Figure 2-5) provides access to disk files and other stored information associated with the MPS.

The File menu provides the following functions:

Open Configuration — Open a file that contains a configuration to set up MPS processing. (See Section 2.4.2.1 for details.)

Save Configuration — Save the current processing configuration to the same file from which it was read. (See Section 2.4.2.2 for details.)

Figure 2-5. File Menu (MPS Main Window)

Save Configuration As — Save the current processing configuration to a file with a different name from the file from which it was read. (See Section 2.4.2.3 for more.)

View — View or edit a file. (See Section 2.4.2.4 for details.)

Exit — Terminate the execution of the MPS software. (Closes the MPS Main Window and any associated dialog boxes.) (See Section 2.4.2.5 for details.)

2.2.2.2 MPS Control Menu

The MPS Control menu (Figure 2-6) provides control of MPS functions.

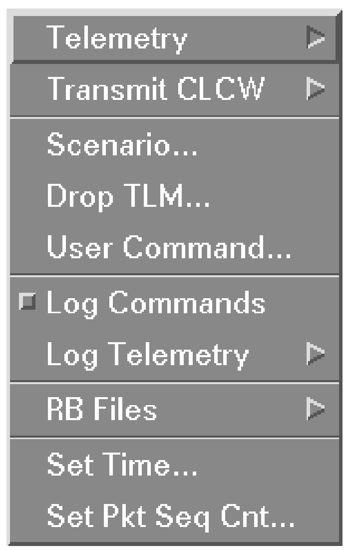


Figure 2-6. Control Menu (MPS Main Window)

The Control Menu provides the following functions:

Telemetry — Start or stop telemetry transmission on one or both channels. (See Section 2.4.3.1 and 2.4.3.2 for details.)

Transmit CLCW — CLCWs are transmitted automatically as part of real-time data transmission. The transmission of CLCWs can be disabled on a per-channel basis. (See Section 2.4.3.3 for details.)

Scenario — Select a scenario file, and start and stop the execution of a scenario. (See Section 2.4.3.4 for details.)

Drop TLM — Specify units to be dropped from the simulated telemetry data. (See Section 2.4.3.5 for details.)

User Command — Enter a command to control the MVME-177. (See Section 2.4.3.6 for details.)

Log Commands — Turn on or off the logging of spacecraft commands that MPS receives. (See Section 2.4.3.7 for details.)

Log Telemetry — Turn on or off, on one or both channels, the logging of spacecraft telemetry that MPS transmits. (See Section 2.4.3.8 for details.)

RB Files — Start, stop, or save the generation of rate-buffered files, on one or both channels, as a result of EDU transmission. (See Section 2.4.3.9 for details.)

Set Time — Change the spacecraft time and/or UTC. (See Section 2.4.3.10 for details.)

Set Pkt Seq Cnt — Set the packet sequence counter for each channel of telemetry. (See Section 2.4.3.11 for details.)

2.2.2.3 MPS Configure Menu

The MPS Configure Menu and its cascade submenu (Figures 2-7 and 2-8) enable you to configure MPS for receiving commands, transmitting telemetry, or setting orbit modeling parameters**.**

The Configure menu options provide the following functions:

Packet Format — Specify the data type and encoding for each telemetry output channel, and which header fields are to be corrupted. (See Section 2.4.4.1 for details.)

Cmd — Configure command reception for either spacecraft simulation mode or EDOS simulation mode. (See Section 2.4.4.2 for details.)

Cmd Validation — Set various options for command validation. (See Section 2.4.4.3 for details.)

CLCW — Override CLCW values in the simulated telemetry. (See Section 2.4.4.4 for details.)

HSIO — Configure the High-Speed Input/Output (HSIO) to transmit telemetry and receive commands (spacecraft simulation mode only). (See Section 2.4.4.5 for details.)

Figure 2-7. Configure Menu (MPS Main Window)

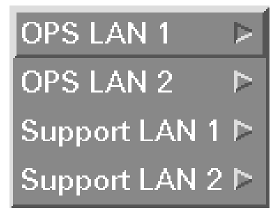


Figure 2-8. Network M/C Mode Cascade Menu

TLM — Configure one or both channels for telemetry transmission (depending on simulation mode). (See Section 2.4.4.6 for details.)

TLM Packet — Set the value of a selected telemetry parameter, or to enter a value into a specific location within a specific packet. (See Section 2.4.4.7 for details.)

Spacecraft Buffer — Set a value within a table load or memory load. (See Section 2.4.4.8 for details.)

Orbit Modeling — Start and stop selected modeling functions for a specific telemetry parameter. (See Section 2.4.4.9 for details.)

Network M/C Mode — Configure network multicasting mode (operational, test, or training/simulation). (See Section 2.4.4.10 for details.)

2.2.2.4 MPS Monitor Menu

The MPS Monitor menu and its cascade submenu (Figures 2-9 and 2-10) provide for monitoring MPS functions.

The MPS Monitor menu options provide the following functions:

CMD/TLM :

Command — Monitor commands. (See Section 2.4.5.1.1 for details.)

CLCW — Monitor the CLCW. (See Section 2.4.5.1.2 for details.)

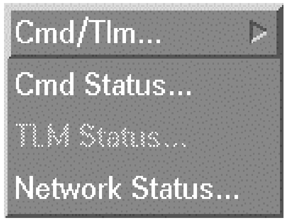


Figure 2-9. Monitor Menu (MPS Main Window)

Figure 2-10. Monitor CMD/TLM Cascade Menu (MPS Main Window)

Parameter — Monitor a telemetry parameter. (See Section 2.4.5.1.3 for details.)

Packet — (Not yet available).

VCDU — Monitor VCDUs on one or both channels (spacecraft simulation mode only). (See Section 2.4.5.1.5 for details.)

EDU — Monitor EDUs on one or both channels (EDOS simulation mode only). (See Section 2.4.5.1.6 for details.)

Cmd Status — Monitor command status. (See Section 2.4.5.2 for details.)

Tlm Status — Monitor telemetry status. (See Section 2.4.5.3 for details.)

Network Status — Monitor network port and IP settings. (See Section 2.4.5.4 for details.)

2.2.2.5 MPS Help Menu

The MPS Help menu (Figure 2-11) provides help on using the MPS main window.

Figure 2-11. MPS Help Menu (MPS Main Window)

The MPS Help menu options provide the following functions:

About MPS — Display help about the MPS main window in general.

On context — Display help about a specific area of the MPS main window.

2.3 MPS Operational Procedures and User Tasks

When you sit down at the MPS, it is likely that you will be doing one of several functions. This may include defining the environment and creating offline data files that will be used in an upcoming simulation, or selecting either the spacecraft or EDOS simulation mode and configuring the system to generate telemetry, or receive commands, or to do both. The sequence of steps to accomplish these various user objectives are listed below.

2.3.1 Environment Definition (Pretest Activities)

There are various files that must be created for the MPS to operate, as well as other files that you may create for specific test executions.

2.3.1.1 Project Data Base Files

The MPS telemetry generation and command validation processes are driven by internal files created from the project data base (PDB) received from the EOS Flight Operations Team (FOT). It is essential that the MPS use the same version of the PDB that is in use by the EOC. The MPS operations team should receive validated copies of the ASCII PDB files whenever the EOC migrates to a new PDB version.

An offline utility is used to convert several of the PDB files into MPS format. Appendix A contains the instructions for using this MPS PDB Generator (XPDB). The created files are stored on the MVME-177.

2.3.1.2 Orbit Modeling Files

A number of files are needed to support the MPS orbit modeling capabilities. These are created using an offline utility, the MPS Orbit Modeling Database Generator (xmdb), which takes your input files and creates several output binary files. Appendix B contains the xmdb user’s guide and provides more information about creating and using the predefined table and algorithm modeling files.

The MPS modeling files are stored on the MVME-177 and include the following:

- mdl_tbls.mdb – model tables
- mdl_algs.mdb – algorithms
- mdl_tlm.mdb – orbit modeling telemetry parameters

2.3.1.3 EDU IP/UDP Files

As part of the system setup configuration needed to operate in the EDOS simulation mode, ASCII files containing lists of valid IP addresses and UDP port numbers must be available. For simulating EDOS for the EOC, MPS will need UDP port numbers to identify the ports that will receive command data blocks from the EOC and that will be sent the packet EDUs, CLCW EDUs, and CODA reports at the EOC.

MPS uses IP and port address files to configure telemetry transmission and command reception for the three network multicast modes for each of the four LANs in the EOC. The IP and port address files are located in the [root]/NETWORK directory on the MVME-177. These files have the extension ".op" for operational mode, ".tst" for test mode, and ".sim" for simulation mode.

The IP and port address files may be edited via the VME editor. Also, you may edit a file on the laptop PC via the following procedure:

Transfer the file to the PC using ftp in ASCII mode.

Edit the file on the PC, using any ASCII editor.

Transfer the file back to the VME, using ftp in ASCII mode.

2.3.1.4 Scenario Files

Scenario files are created using any local text editor and stored as ASCII files on the MVME-187. These files are accessed during test operations to set telemetry parameter values. Appendix D provides information on creating scenario files.

The MPS scenario file cannot be used to control any aspect of MPS execution other than setting telemetry parameters, as if you had clicked on any of the options under the *Control* or *Monitor* menus. Its advantage is that you can set many parameters without further action once you have created the file.

The MPS scenario file contains directives to set telemetry parameters, one per line. Each directive consists of a relative time, the parameter's mnemonic name, and its value in the following format:

doy:hh:mm:ss mnemonic,x

The time specified is relative to the start of the scenario execution. For optimum performance, you should allow at least one second between time tags for successive directives. The following is a sample MPS scenario:

```
000:00:00:01 MIS_VR_CAMERA_AN1ESC,3
000:00:00:02 MIS_TR_CAMERA_AFOPT3,1
000:00:00:03 MIS_TR_CAMERA_AFOPT4,0
000:00:00:20 GNC_SR_ESS1_RPM,45
000:00:00:47 COM_BR_SBT2_CH2_TLM,8
000:00:00:50 AST_IR_M_MPSA_OUT,2
000:00:01:03 MOD_CR_PS1_on,1
000:00:01:04 GNC_BR_ACEB_CSM_TMR,50
```

Appendix D contains information on how to create and use enhanced-format scenario files using the Scenario File Converter utility.

2.3.2 Spacecraft Simulation Mode Operations

Select Spacecraft simulation mode and data source from the MPS Main Window. You are now ready to use MPS in Spacecraft mode.

2.3.2.1 Spacecraft Serial Telemetry Generation and Monitoring

The following steps describe a typical serial telemetry generation and monitoring task in spacecraft simulation mode.

1) <u>Set Spacecraft Time and UTC</u>: Select the *Set Time* option from the Control menu and enter the desired times in the Set Time dialog box (see section 2.4.3.10 for details).

2) <u>Set transmission mode and channel configurations</u>: Select the *TLM* option from the Configure menu and click on desired communications mode and channel configurations for the desired serial streams (see section 2.4.4.6.1 for details).

3) <u>Configure telemetry packets</u>: Select the *TLM Packet* option from the Configure menu and click on desired packet/channel combinations (see section 2.4.4.7 for details).

4) <u>Generate serial telemetry</u>: Select the *Start Telemetry* option from the Control menu and choose one or both channels (see section 2.4.3.1 for details).

5) <u>Monitor channel statistics</u>: Select the *Tlm Status* option from the Monitor menu and choose the channel statistics to be monitored (see section 2.4.5.3 for details).

6) <u>Monitor the data stream</u>: Select the *CMD/TLM* option from the Monitor menu and the *VCDU* option from the cascade menu, and choose the channel to be monitored (see section 2.4.5.1.5 for details).

7) <u>Log telemetry generated:</u> (discrepancy support): Select the *Log Telemetry* option from the Control menu and turn on logging (see section 2.4.3.8 for details).

8) <u>Set specific telemetry parameter values</u>: Select the *TLM Packet* option from the Configure menu and override parameter values (see section 2.4.4.7 for details).

9) <u>Monitor a telemetry parameter</u>: Select the *CMD/TLM* Option from the Monitor menu and the *Parameter* option from the CMD/TLM cascade menu, and enter a parameter whose value to monitor. Monitor the parameter change in the Monitor Parameter dialog box (see section 2.4.5.1.3 for details).

10) <u>Model the orbit</u>: Select the *Orbit Modeling* option from the Configure menu and choose the parameter/table combination to apply. Monitor the parameter value change from either the

VCDU Monitor Dialog Box (Figure 2-49) or the Monitor Parameter Dialog Box (Figure 2-47) (see section 2.4.4.9 for details).

11) Inject dropout errors into the telemetry: Select the *Drop Tlm* option from the Control menu and set the number of VCDUs to drop on one or both channels, to suspend transmission of VCDUs temporarily (see section 2.4.3.5 for details).

12) End telemetry monitoring: Close any open Monitor dialog boxes (see section 2.4.5 for details).

13) Stop telemetry logging: Select the *Log Telemetry* option from the Control menu (see section 2.4.3.8 for details).

14) Stop telemetry transmission: Select the *Stop TLM* option from the Control menu and choose all active telemetry streams (see section 2.4.3.2 for details).

15) Save this MPS configuration: Select the *Save Configuration* option from the File menu (see sections 2.4.2.2 and 2.4.2.3 for details). This will save the current MPS configuration into a configuration file for future use.

2.3.2.2 Spacecraft Serial Command Processing and Monitoring

The following steps describe a typical serial command processing and monitoring task in spacecraft simulation mode.

1) Set the communications mode: Select the *CMD* option from the Configure menu and either click on the desired communications mode or select data stream entities. (See Section 2.4.4.2 for details.)

2) Set up command validation: Select the *Cmd Validation* option from the Configure Menu and click on the desired COP-1 validation combinations (see section 2.4.4.3 for details).

3) Log commands received (discrepancy support): Select the *Log Commands* option from the Control menu (see section 2.4.3.7 for details).

4) Monitor command processing statistics: Select the *Cmd Status* option from the Monitor menu (see section 2.4.5.2 for details).

5) Monitor commands received: Select the *CMD/TLM* option from the Monitor menu and then the *Command* option from the *CMD/TLM* cascade menu (see section 2.4.5.1.1 for details).

6) Override CLCW values: Select the *CLCW* option from the Configure menu and override values of CLCW (see section 2.4.4.4 for details). Monitor changes (see section 2.4.5.1.2 for details).

7) End command monitoring: Close any open Command Monitor dialog boxes.

8) End command logging: Select the *Log Commands* option from the Control menu (see section 2.4.3.7 for details).

2.3.2.3 Spacecraft Simulation Mode Test Analysis

1) Shut down all MVME-177 tasks and view command, telemetry, and configuration files with your favorite text editor.

2.3.3 EDOS Simulation Mode Operation

Select EDOS simulation mode and data source from the MPS Main Window. You are now ready to use MPS in EDOS mode.

2.3.3.1 EDOS Telemetry Generation and Monitoring

The following steps describe a typical telemetry generation and monitoring task in EDOS simulation mode.

1) <u>Set Spacecraft Time and UTC</u>: Select the *Set Time* option from the MPS Control menu and enter the desired times in the Set Time dialog box (see section 2.4.3.10 for details).

2) <u>Set EDOS service header overrides</u>: Select the *TLM* option from the Configure menu and click on desired EDOS service header overrides for the desired stream(s) (see section 2.4.4.6.2 for details).

3) <u>Configure telemetry packets</u>: Select the *Packet Format* option from the Configure menu and click on desired packet/channel combinations (see section 2.4.4.1 for details).

4) <u>Initiate RB file generation</u>: Select the *RB Files* option from the Control menu and choose one or both channels (see section 2.4.3.9 for details).

5) <u>Generate telemetry in EDUs</u>: Select the *Start TLM* option from the Control menu and choose one or both channels (see section 2.4.3.1 for details).

6) <u>Monitor channel statistics</u>: Select the *TLM Status* option from the Monitor menu and choose the channel statistics to be monitored (see section 2.4.5.3 for details).

7) <u>Monitor the data stream</u>: Select the *CMD/TLM* option from the Monitor menu and the *EDU* option from the *CMD/TLM* cascade menu, and choose the data stream to be monitored. (See Section 2.4.5.1.6 for details.)

8) <u>Set specific telemetry parameter values</u>: Select the *TLM Packet* option from the Configure menu and override parameter values (see section 2.4.4.7 for details).

9) <u>Monitor a telemetry parameter</u>: Select the *CMD/TLM* option from the Monitor menu and choose a parameter to monitor. Monitor the parameter value change in the Monitor Parameter dialog box (see section 2.4.5.1.3 for details).

10) <u>Model orbit</u>: Select the *Modeling* option from the Configure menu and choose the parameter/table combination to apply. Monitor the parameter value change from either the

EDU Monitor Dialog Box (Figure 2-51) or the Monitor Parameter Dialog Box (Figure 2-47) (see section 2.4.4.9 for details).

11) Inject dropout errors into the telemetry: Select the *Drop Tlm* option from the Control menu and set the number of EDUs to drop on one or both channels, to suspend transmission of EDUs temporarily (see section 2.4.3.5 for details).

12) End telemetry monitoring: Close any open Monitor dialog boxes.

13) Stop RB file logging: Select the *RB Files* option from the Control menu (see section 2.4.3.9 for details).

14) Stop telemetry transmission: Select the *Stop Tlm* option from the Control menu and choose one or both telemetry streams (all that are active) (see section 2.4.3.2 for details).

15) Save this configuration: Select the *Save Configuration* option from the File menu (see sections 2.4.2.2 and 2.4.2.3 for details). This will save current MPS configuration into a configuration file that can be used during a future session.

2.3.3.2 EDOS Command Processing and Monitoring

The following steps describe typical command processing and monitoring in EDOS simulation mode.

1) Configure commands: Select the *CMD* option from the Configure menu and set the command ground header message validation values. (See Section 2.4.4.2.2 for details.)

2) Set up command validation: Select the *Cmd Validation* option from the Configure Menu and click on the desired COP-1 validation combinations (see section 2.4.4.3 for details).

3) Log commands received (discrepancy support): Select the *Log Commands* option from the Control menu (see section 2.4.3.7 for details).

4) Monitor command processing statistics: Select the *Cmd Status* option from the Monitor menu (see section 2.4.5.2 for details).

5) Monitor commands received: Select the *CMD/TLM* option from the Monitor menu and then the *Command* option from the *CMD/TLM* cascade menu (see section 2.4.5.1.1 for details).

6) Monitor CLCW values: Select *CMD/TLM* from the Monitor menu and then *CLCW* from the *CMD/TLM* cascade menu (see section 2.4.5.1.2 for details).

7) Transmit CLCWs: Select the *Transmit CLCW* option from the Control menu to enable CLCW EDU transmission. (See Section 2.4.3.3 for details.)

8) Override CLCW values: Select the *CLCW* option from the Configure menu and override values of CLCW (see section 2.4.4.4 for details). Monitor changes (see section 2.4.5.1.2 for details).

9) End command monitoring: Close any open Command Monitor dialog boxes.

10) End command logging: Select the *Log Commands* option from the Control menu (see section 2.4.3.7 for details).

2.3.3.3 EDOS Simulation Mode Test Analysis

1) Shut down all MVME-177 tasks and view command, telemetry, and configuration files with your favorite text editor.

2.4 Using MPS Functions

2.4.1 MPS Main Window

When you start MPS, the main window (Figure 2-4) appears. The MPS main window provides access to MPS functions and presents status messages and important configuration information.

Spacecraft time is used to timetag telemetry packets; UTC is used to timestamp blocked transmission of CADUs. MPS automatically sets both spacecraft time and UTC to the current system time at MPS startup. To change one of both of these times, use the *Set Time* option under the Control menu. (See Section 2.4.3.10 for details.)

Scenario File reflects whether a scenario is being executed. If so, the filename of the scenario is displayed; if not, this text field is blank and its label is dim. To execute a scenario or change the scenario file, use the *Scenario* option under the Control menu. (See Section 2.4.3.4 for details.)

Simulation Mode reflects whether MPS is simulating EDOS or the EOS spacecraft. The simulation mode determines many of the default settings and the options available in other windows and dialog boxes; options not available for a particular mode are visible but dim.

- In spacecraft simulation mode, MPS communicates with EDOS as if through the Space Network (SN) or the contingency Ground Network (GN).
- In EDOS simulation mode, MPS communicates directly with the EOC in EDOS formats using network protocols. Playback data transmission generates rate-buffered data automatically, although you can turn off rate buffering for one or both channels (by using the *RB Files* cascade menu under the Control menu; see Section 2.4.3.9 for details).

To set simulation mode, click on one of the two radio buttons in this group.

You can set the simulation mode only if telemetry is not active. If telemetry is active, the “Simulation Mode” radio button group will be dim; to stop telemetry, use the *Stop TLM* option in the MPS Control menu. (See Section 2.4.3.2 for details.)

<u>Data Source</u> indicates the source to be used for simulating telemetry data — either a housekeeping (HK) data file, or the EOS-AM1 project data base (PDB).

You can change the data source only if telemetry is not active. If telemetry is active, the “Data Source” area will be dim; to stop telemetry, use the *Stop TLM* option in the MPS Control menu. (See Section 2.4.3.2 for details.)

To use housekeeping data if the PDB is being used, click on the **HK File** radio button. The HK File dialog box (Figure 2-12) will appear.

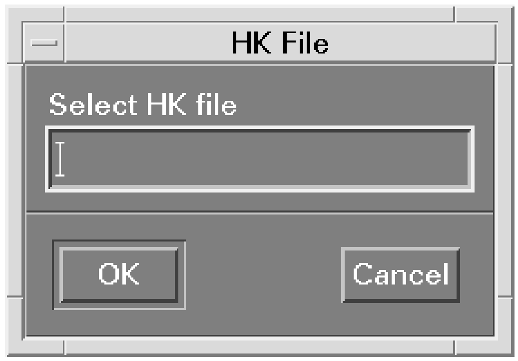


Figure 2-12. Housekeeping File Dialog Box

Enter the name of an HK file in the text field and click on **OK**. The dialog box will close, and the HK file name that you entered will appear in the text area to the right of the “HK File” radio button in the MPS main window. MPS will use the specified HK file as a data source and will generate telemetry based on its contents. If you enter an HK file name that does not exist, a “file not found” message appears on the MVME-177 console. (Note: HK file names are case sensitive.)

When you have entered a valid HK file name, MPS will display a message in the status log area indicating that it has started reading the file. When MPS has finished reading the file, it will display a message to that effect.

In spacecraft simulation mode, MPS can use housekeeping files as telemetry on the Q channel (for example, to simulate a playback data stream). When the file is finished, MPS will continue to generate telemetry in housekeeping format.

If you change your mind about using an HK file before you have clicked on **OK**, click on **Cancel** in the HK File dialog box. The HK File dialog box will close and the **PDB** radio button will once again be selected in the MPS main window.

To use the PDB if an HK file is being used, click on the **PDB** radio button. MPS will operate in a dynamic mode, creating packets based on information in the EOS-AM1 data base.

When using the PDB, you have the option to direct MPS to set activity log entries in the HK packets by using a pregenerated activity log file. To use an activity log file, click on the **Activity Log** check button, and the Activity Log File dialog box (Figure 2-13) will appear.

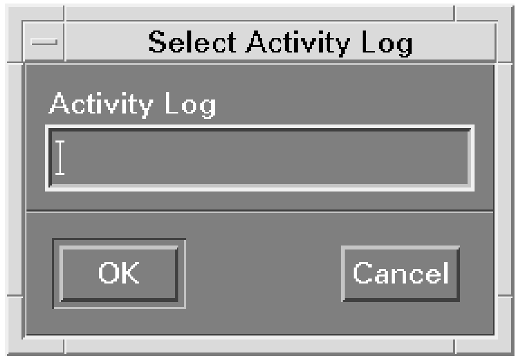


Figure 2-13.   Activity Log Dialog Box

Enter the name of an activity log file and click on **OK**. The dialog box will close, and the filename you entered will appear in the Activity Log file field in the MPS main window. MPS will use the parameters in that activity log file to fill in the appropriate entries in the telemetry. (Note: The Activity Log File dialog box is not a file selection box because the various activity log files exist on the MVME-177 platform, not the MVME-187 front end, and the MPS user interface process does not know about them to display a list for selection.) If you enter the name of an activity log file that does not exist, the message "file not found" will appear on the MVME-177 console.

If you change your mind about using an activity log file before you have clicked on **OK**, click on **Cancel** in the Activity Log File dialog box. The dialog box will close, the "Activity Log" check button will no longer be selected, and no activity log file name will appear in the MPS main window.

If an activity log file is in use (the **Activity Log** check button is selected and a file name is showing in the text field) and you decide not to use one, simply click on the **Activity Log** check button. The check button will become unselected and the file name will disappear.

The status log area at the bottom of the MPS main window includes messages concerning process status, command directives, and errors. Every entry in the log is stamped with the time of its occurrence. Status log messages appear at the end of this list as MPS generates them. To see older messages that have scrolled out of view, use the scroll bar at the right side of the status log area.

MPS also logs the status messages into the status log file on disk. This file is located in the directory named in the environment variable $ETS_PROC_LOG_DIR (see Section 2.1.4.3) and is named with the date and time of its creation. You can view or print the status log file using the appropriate options under the MPS File menu (see Section 2.4.2.4).

2.4.2 MPS File Menu Functions

2.4.2.1 Open Configuration

The *Open Configuration* menu option in the MPS File menu opens a file that contains an MPS processing configuration — the values of the various configuration and mode parameters that drive MPS operation — for reconfiguring the MPS as described in the configuration file. Select from the Select Configuration File dialog box (Figure 2-14). (See Section 1.3.4.5 for file selection details.)

2.4.2.2 Save Configuration

The *Save Configuration* menu option in the MPS File menu saves the current processing configuration to the same file from which it was read, or to the configuration file to which it was most recently saved. The file will include any changes you have made to the MPS configuration. No dialog box appears because no further action from you is required.

2.4.2.3 Save Configuration As

The *Save Configuration As* menu option in the MPS File menu allows you to save the current MPS processing configuration to a different file name. Select or enter a configuration file name in the Save Configuration As dialog box (Figure 2-14). (See Section 1.3.4.5 for file selection details.)

2.4.2.4 View

The *View* menu option in the MPS File menu allows you to view any text file on the MVME-187 (the MPS front end). The File Selection dialog box (Figure 2-15) will appear, from which you can select the file to view. To view the file, click on **OK**.

When the file has been selected, a text editor window will appear that shows the contents of the selected file. If the file is write protected, you will be able to view it only. If not, you may edit it.

MPS automatically uses the text editor that is indicated in the UNIX environment variable "EDITOR" (if none is specified, MPS uses vi). Use this text editor to view or edit the selected file. (Refer to the text editor manual for information on how to view and/or edit the file.)

The view window closes automatically when you quit or exit the text editor.

2.4.2.5 Exit

The *Exit* menu option in the MPS File menu terminates the execution of the MPS software. It closes the MPS main window and any MPS dialog boxes that may have been open when you selected the *Exit* option.

If telemetry is active (transmission is in progress), a confirmation dialog box (Figure 2-16) appears.

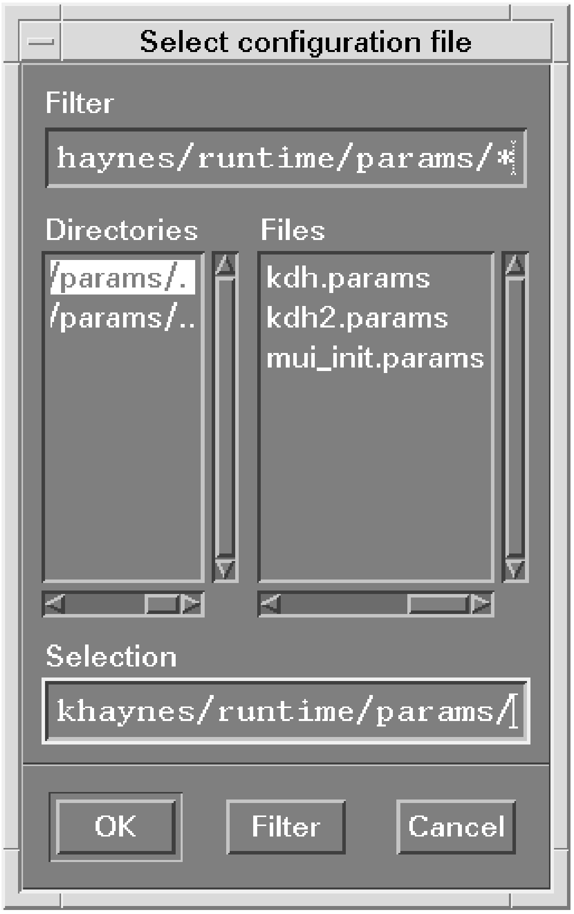


Figure 2-14. Select or Save As Configuration File Dialog Box

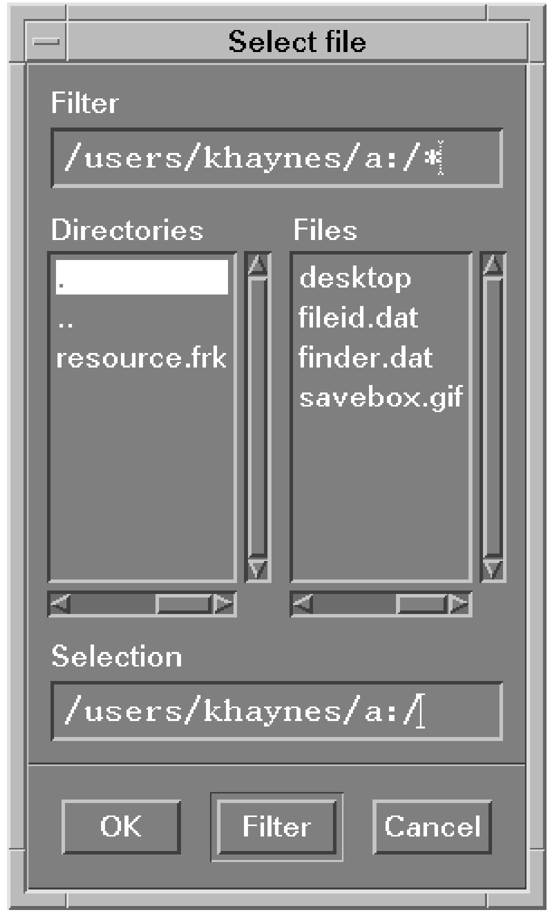


Figure 2-15. File Selection Dialog Box

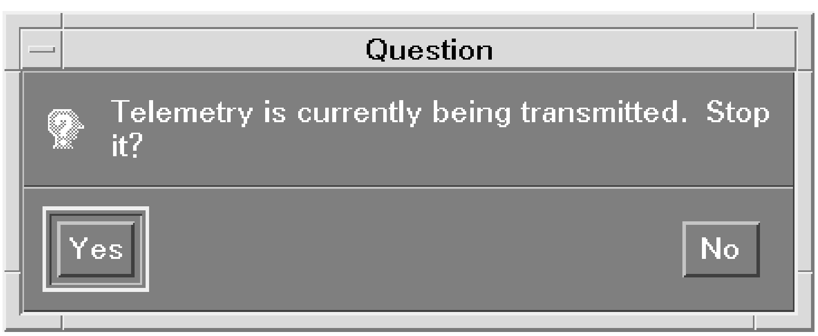


Figure 2-16. Exit Confirmation Dialog Box

Warning
Clicking on **No** does not exit without stopping telemetry. It cancels the exit.

To terminate telemetry and shut down the MPS, click on **Yes** in this confirmation box. This closes the MPS main window and any associated dialog boxes.

To cancel the shutdown and continue using MPS, click on **No**. The MPS main window and any associated dialog boxes remain open and active.

If telemetry is not active, MPS will terminate without your having to take any further action.

2.4.3 MPS Control Menu Functions

2.4.3.1 Start Telemetry

The *Start Tlm* menu option in the MPS Control menu allows you to start telemetry on one or both channels. After you have selected *Start Tlm* from the Control menu, select *Channel 1*, *Channel 2*, or *Both* from the *Start Tlm* cascade menu (Figure 2-17).

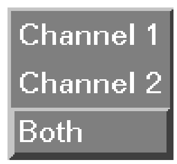


Figure 2-17. Start [Stop] Telemetry Cascade Menu

If telemetry is already active on one of the two channels, only the inactive channel will be selectable, and the other two options (the other channel and "*Both*") on the cascade menu will be dim.

When you start telemetry in the EDOS simulation mode, MPS instructs the OMD Simulator (OMDSIM) to start CODA transmission. (If OMDSIM is not executing or if it has already started CODA transmission, the *Start Telemetry* option has no effect.)

2.4.3.2 Stop Telemetry

The *Stop Tlm* menu option in the MPS Control menu allows you to stop telemetry for one or both channels. After you have selected *Stop Tlm* from the Control menu, select *Channel 1*, *Channel 2*, or *Both* from the *Stop Tlm* cascade menu (Figure 2-17). If telemetry is being transmitted on only one channel, only that channel is available for stopping, and the other two options (the other channel and "*Both*") on the cascade menu are dim. If both channels are active, either of the channels can be stopped, leaving the other transmitting.

When all telemetry is stopped in the EDOS simulation mode, MPS sends a message to the OMD Simulator to stop CODA transmission. (If OMDSIM is not executing or if it is not transmitting CODA, the *Stop Telemetry* option has no effect.)

2.4.3.3 Transmit CLCW

The *Transmit CLCW* menu option in the MPS Control menu allows you to enable or disable the transmission of CLCWs on one or both channels in EDOS simulation mode (Figures 2-18 and 2-19). Initially, the transmission of CLCWs is active (enabled) on both channels.

After you have selected *Transmit CLCW* from the Control menu, select Enable or Disable from the *Transmit CLCW* cascade menu (Figure 2-18), then Channel 1, Channel 2, or Both from the *Transmit CLCW Channel* cascade menu (Figure 2-19).

Figure 2-18. Transmit CLCW Cascade Menu

Figure 2-19. Transmit CLCW Channel Cascade Menu

When CLCW transmission is inactive on at least one channel, the *Enable* option is available in the *Transmit CLCW* cascade menu, and the inactive channel(s) are available in the *Transmit CLCW Channel* cascade menu. To start CLCW transmission, select the *Enable* option and then select one or both channels from the *Transmit CLCW Channel* cascade menu.

When MPS is transmitting CLCWs on one or both channels, the *Disable* option is available in the *Transmit CLCW* cascade menu, and the active channels are available in the *Transmit CLCW Channel* cascade menu. To stop CLCW transmission, select the *Disable* option and then select one or both channels from the *Transmit CLCW Channel* cascade menu.

2.4.3.4 Scenario

The *Scenario* option in the MPS Control menu allows you to execute and monitor a predefined simulator scenario of setting values within telemetry packets. The File Selection dialog box (figure 2-15) appears for you to select a scenario file. (See Section 1.3.4.5 for details on using file selection dialog boxes.) The Scenario dialog box (Figure 2-20) enables you to start and stop the scenario and to monitor its progress.

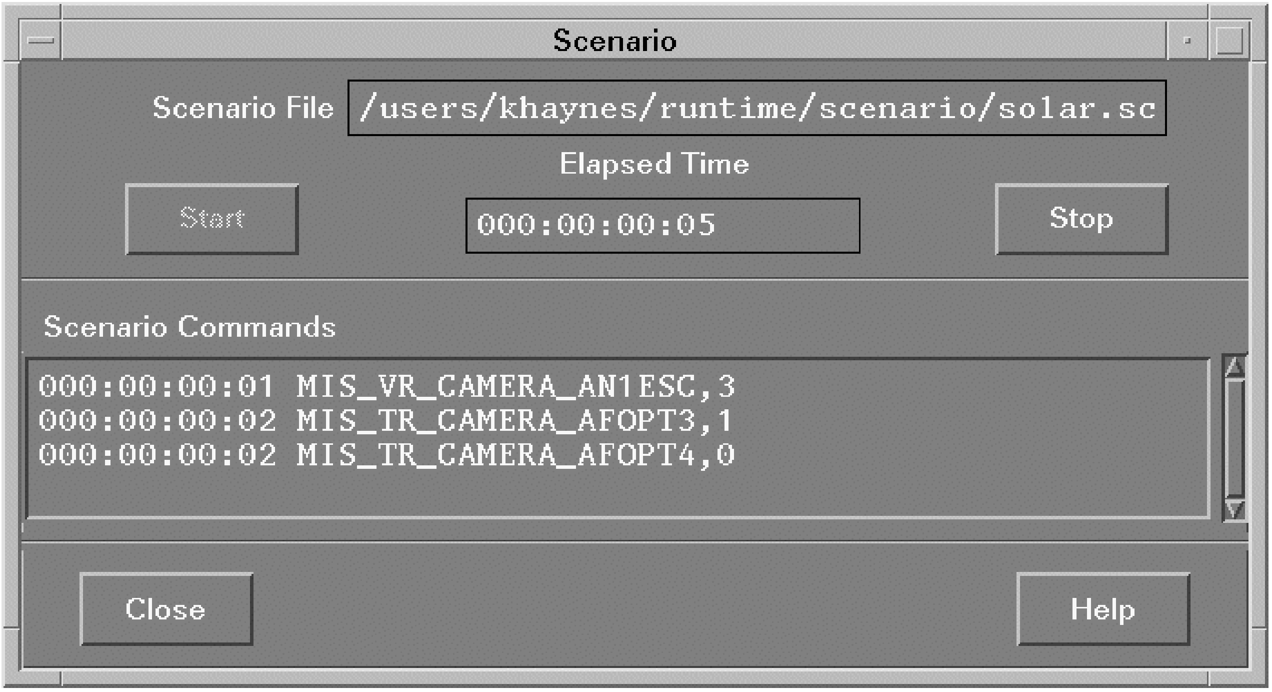


Figure 2-20. Scenario Dialog Box

MPS reads the simulator commands from a scenario file, which contains telemetry configuration directives and the relative times at which they are to be executed. The name of the scenario file is displayed at the top of the Scenario dialog box. A scenario file can be created and edited via a text editor (such as vi) or via the *View* option in the File menu. Appendix D contains information on creating scenario files.

After you have selected a scenario file (and have clicked on the **OK** pushbutton), the scenario is ready to be started, and the **Start** pushbutton in the lower part of the Scenario dialog box becomes available. (This pushbutton is dim until a scenario file has been selected.)

To start the execution of the simulator directives in the scenario, click on **Start**. The "Elapsed Time" field shows the time elapsed since the scenario was started, and the scrolling region at the bottom of the dialog box shows the directives in the scenario file as they are queued for execution. The **Start** pushbutton becomes dim, and the **Stop** pushbutton becomes available. To stop the scenario at any time during its execution, click on the **Stop** pushbutton. (Once you have stopped a scenario, you cannot restart it; you can only start it again from the beginning.)

When the last directive in the scenario has been executed, the scenario is complete, and the **Stop** pushbutton is dim. To execute the same scenario again, click on the **Start** pushbutton.

To close the Scenario dialog box, click on **Close**.

Closing the Scenario dialog box does not automatically stop the execution of a scenario. If you close the Scenario dialog box while a scenario is being executed, MPS displays a confirmation dialog box (Figure 2-21) asking if you want to stop scenario execution.

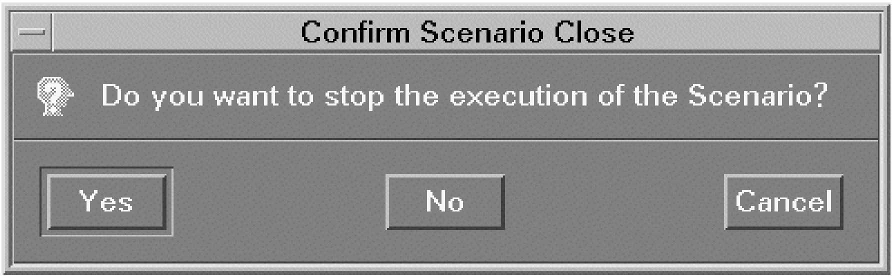


Figure 2-21.   Confirm Scenario Close Dialog Box

To stop scenario execution and close the Scenario dialog box, click on **Yes**. To continue scenario execution and close the Scenario dialog box, click on **No**. To keep the Scenario dialog box open and cancel your “Close” action, click on **Cancel** in the confirmation dialog box.

Note: If you close the Scenario dialog box while a scenario is executing, and you later want to stop the execution of the scenario before the end, you will have to bring the Scenario dialog box back (via the *Scenario* option under the MPS main window’s Control menu).

2.4.3.5 Drop Tlm

The *Drop Tlm* menu option in the MPS Control menu allows you to suppress the transmission of some telemetry temporarily, to simulate errors on one or both channels. The Drop Telemetry dialog boxes (Figures 2-22 and 2-23) allow you to define how much telemetry to drop on which channel(s).

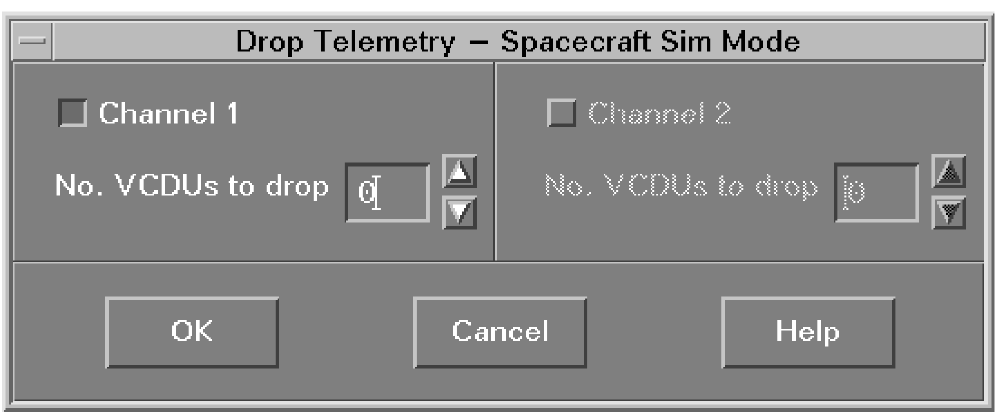


Figure 2-22.   Drop Telemetry Dialog Box (Spacecraft Simulation Mode)

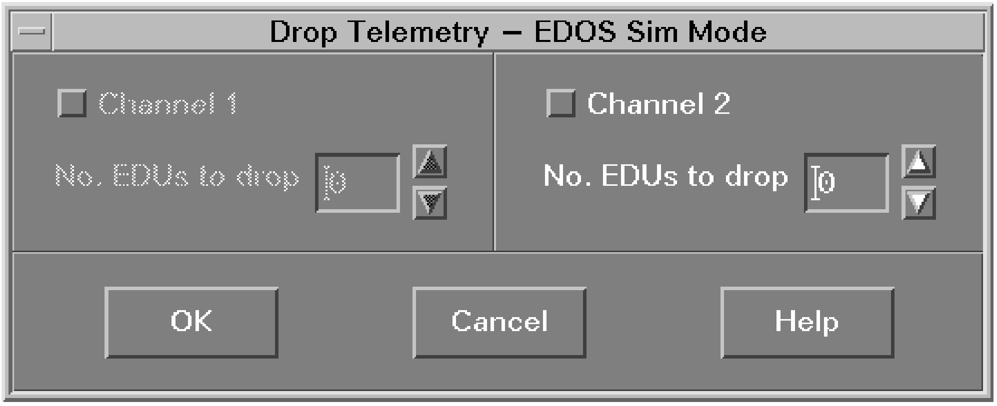


Figure 2-23. Drop Telemetry Dialog Box (EDOS Simulation Mode)

To drop telemetry, you must first start telemetry on the channel(s) on which you want to drop it. (See Section 2.4.3.1 for details.) The check buttons for channels 1 and 2 indicate the channels for which you are going to change the dropping of telemetry. In spacecraft simulation mode, you can set or change the number of VCDUs to drop. In EDOS simulation mode, you can set or change the number of EDUs to drop.

To simulate dropped VCDUs, MPS overwrites the CADU frame sync pattern in the specified number of outgoing VCDUs, causing a dropout at the receiving end. To simulate dropped EDUs, MPS simply omits the transmission of the specified number of EDUs.

The Drop Telemetry dialog box reflects the channels on which telemetry is being generated: If telemetry is not being generated on a channel, the area of the dialog box for that channel is dim. To change the number of units for a channel, click on the check button for that channel and then use the "No. [VCDUs/EDUs] to drop" spinner. (See Section 1.3.6.4 for details on the use of spinners.)

Note: To change the number of units, you *MUST* click on the check button for the channel.

To drop the specified number of units (and close the Drop Telemetry dialog box), click on **OK**. To close the dialog box without saving changes to the drop numbers, click on **Cancel**.

2.4.3.6 User Command

The *User Command* menu option in the MPS Control menu allows you to enter into the User Command dialog box (Figure 2-24) one of a set of predefined commands to control certain MPS functions.

This release provides for a number of user commands, as described in Appendix C.

Figure 2-24. User Command Dialog Box

2.4.3.7 Log Commands

The *Log Commands* menu check button in the MPS Control menu allows you to initiate and terminate command logging. This capability operates in both Spacecraft simulation mode and EDOS simulation mode. MPS automatically creates the command log file on the MVME-177 under the subdirectory of your home directory that contains the current PDB. (The name of the command log file is "COMMAND.CLTU".) MPS then begins logging received spacecraft commands into the command log file.

To stop command logging and close the command log file, deselect the "*Log Commands*" check button in the Control menu. You can view this log file using the PDOS "sf" command on the MVME-177 or can transfer it via ftp to a personal computer and view it with an ASCII text editor.

2.4.3.8 Log Telemetry

The *Log Telemetry* menu option in the MPS Control menu allows you to initiate and terminate telemetry logging on one or both channels, and to save (copy) the telemetry log(s) to disk. Full telemetry logging is available only in spacecraft simulation mode; in EDOS simulaton mode you can use the RB files function to accomplish some level of EDU logging [see Section 2.4.3.9].)

After you have selected *Log Telemetry* from the MPS Control menu, select Channel 1, Channel 2, or Both from the *Log Telemetry* cascade menu (Figure 2-25).

When telemetry logging is inactive on at least one channel, the *Start* option is available in the *Log Telemetry* cascade menu, and the inactive channel(s) are available in the *Start Channel* cascade menu (Figure 2-26). To start telemetry logging, select the *Start* option and then select one or both channels from the *Start Channel* cascade menu. When you start telemetry logging, MPS begins logging telemetry to a special area of memory, the dynamic random access memory (DRAM) card. MPS logs telemetry to memory instead of to disk to avoid slowing down the simulation.

When MPS is logging telemetry on one or both channels, the *Stop* option is available in the *Log Telemetry* cascade menu, and the active channels are available in the *Stop Channel* cascade menu

Figure 2-25. Log Telemetry Cascade Menu

Figure 2-26. Log Telemetry Channel Cascade Menu (Start, Stop, and Copy)

(Figure 2-26). To stop telemetry logging, select the *Stop* option and then select one or both channels from the *Stop Channel* cascade menu.

When telemetry logging has been started and stopped on one or both channels, the *Copy* option is available in the *Log Telemetry* cascade menu, and the stopped channel(s) are available in the *Copy Channel* cascade menu (Figure 2-26). To copy (save) the current contents of the telemetry log file to disk for viewing, select the *Copy* option and then select the channel whose log is to be saved. MPS automatically creates the telemetry log file(s) on the MVME-177 under the current PDB subdirectory of your home directory (e.g., 10:/integ/release150/PDB19). MPS gives these files the names “ch1_vcdu_log.dat” for channel 1 and “ch2_vcdu_log.dat” for channel 2.

A telemetry log file can be viewed using the PDOS fdump utility on the MVME-177, or it can be transferred (via ftp) to a personal computer and viewed with a binary file editor.

2.4.3.9 RB Files

The *RB Files* menu option in the MPS Control menu allows you to start or stop the generation of rate-buffered data as a result of EDU transmission. (This option is available only in EDOS simulation mode.)

After you have selected *RB Files* from the Control menu, select Start, Stop, or Copy from the *RB Files* cascade menu (Figure 2-27), then Channel 1, Channel 2, or Both from the *RB Files Channel* cascade menu (Figure 2-28).

Figure 2-27. RB Files Cascade Menu

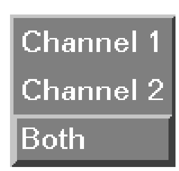


Figure 2-28. RB Files Channel Cascade Menu (Start, Stop, and Copy)

When RB file generation is inactive on at least one channel, the *Start* option is available in the *RB Files* cascade menu, and the inactive channel(s) are available in the *Start Channel* cascade menu (Figure 2-28). To start rate-buffered file generation, select the *Start* option and then select one or both channels from the *Start Channel* cascade menu. When you start RB file generation, MPS begins storing the RB data to a special area of memory, the dynamic random-access memory (DRAM) card. MPS logs RB file data to memory instead of immediately to disk, to allow the simulation to execute as quickly as possible.

When MPS is generating RB files on one or both channels, the *Stop* option is available in the *RB Files* cascade menu, and the active channels are available in the *Stop Channel* cascade menu (Figure 2-28). To stop RB file generation, select the *Stop* option and then select one or both channels from the *Stop Channel* cascade menu.

When RB file generation has been started and stopped on one or both channels, the *Copy* option is available in the *RB Files* cascade menu, and the stopped channel(s) are available in the *Copy Channel* cascade menu (Figure 2-28). To copy (save) the current contents of the RB file(s) to disk for viewing, select the *Copy* option and then select the channel whose log is to be saved. MPS automatically creates the RB file(s) on the MVME-177 in the current PDB subdirectory of your home directory. RB files for channel 1 have the Unique File Number field of the file name indexed from 0 to 10; channel 2 RB files have the Unique File Number field indexed from 11 to 20. These names conform to the file naming conventions defined in Section 5.4.1 of the Interface Control Document (ICD) between EDOS and the EOS Ground System (EGS) elements.

MPS creates RB files and stores them in the data base directory from where MPS is running (e.g., “10:/integ/release140/PDB14”). You can use ftp to transfer any RB file to a destination of your choice. To transfer the file, open a new terminal window from the MVME-187 (the laptop is not needed for this), run the ftp utility, use the mouse to select the RB files to be transferred, and use the UNIX “touch” command to create a signal file. Table 2-2 shows the steps for transferring RB files. (Substitute the current MVME-177 IP address for the address shown in this table.)

The EDU data that MPS transmits in real time are also written to an RB file when the RB Files option is enabled. These EDU and RB file data are almost identical (the exception being that in the RB file the playback data bit is set in the EDOS Service Header of every EDU logged). Thus, RB file generation provides some support for logging transmitted EDUs. With this function you can simulate the creation of overlapping data transmitted to the EOC, first as real-time EDU transmission and later as transmission of an RB file, optionally containing some of the same packet data. If you don’t want the real-time data to go to the EOC, either select another LAN to receive the data or change the destination to a non-EOC IP address or UDP port.

```
1. Open new terminal (click right mouse button) and establish ftp session:
     > ftp
     > open 198.118.198.66    OR      MVME-177 IP address for MPS#1
       open 198.118.197.69            MVME-177 IP address for MPS#2
     > userid:soc, password:soc       userid/password for either MPS
     > cd <your path>                 location of RB file
     > bin                            file is binary
     > ls *.RBD                       display list of RB files
     > get <filename>                 use mouse to select file
     > bye                            end ftp session

2. From the console, create signal file:
     > touch <filename>.XFR           use mouse to select file name

3. Then ftp files to their destination:
     > ftp
     > connect <your destination>     establish ftp session
     > <userid> <password>            enter your userid, password
     > bin                            files are binary
     > put <RB file name>             RB file (.RBD)
     > put <signal filename>          signal file (.XFR)
     > bye                            end ftp session
```

Table 2-2. Procedure for Transferring Rate-Buffered Files

2.4.3.10 Set Time

The *Set Time* menu option in the MPS Control menu allows you to set both spacecraft time and UTC. The Set Time dialog box (Figure 2-29) allows you to set individual components (from year to second) of each of these times.

MPS initializes both UTC and spacecraft time to the time given by the system clock on the MVME-187 component of MPS, and it is these values that appear in the time fields each time you bring up this dialog box. To change a time unit, either edit the value in the text field or use the up and down arrows on the field's right side. (See Section 1.3.6.4 for details on the use of spinners.)

To establish your changes to the spacecraft or UTC time, click on the **Set** pushbutton for that time. To reset a time to the current system time on the MVME-187, click on that time's **Reset** pushbutton.

To close the Set Time dialog box, click on **Close**.

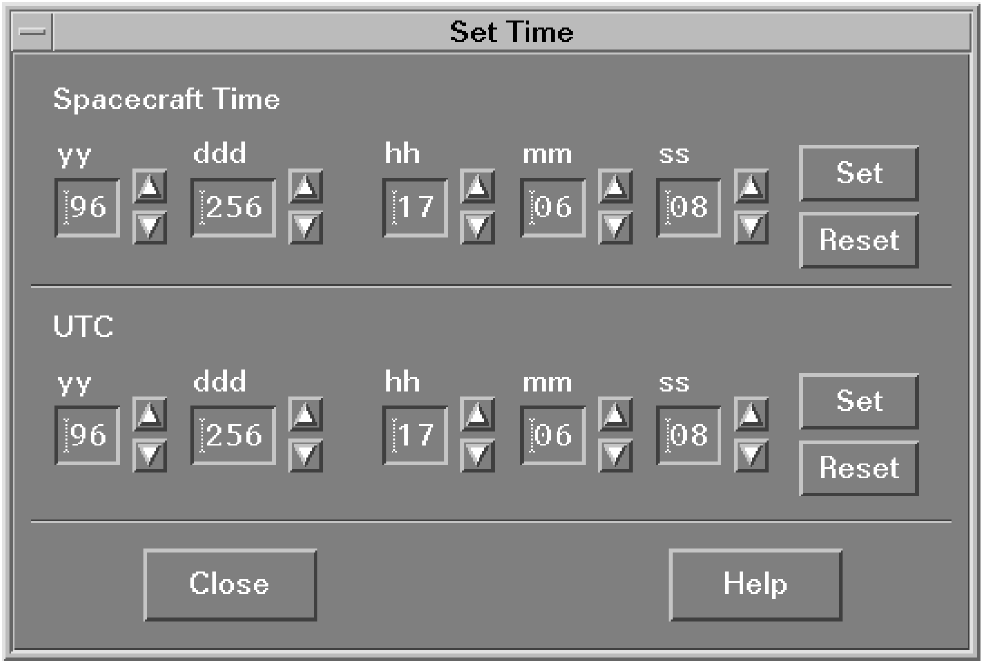


Figure 2-29. Set Time Dialog Box

2.4.3.11 Set Pkt Seq Cnt (Packet Sequence Counter)

The *Set Pkt Seq Cnt* menu option in the MPS Control menu allows you to set the packet sequence counter in the packet primary header to a value from zero to 16,383 for each telemetry channel (Figure 2-30). To change the packet sequence counter value for a channel, either edit the value in the text field or use the up and down arrows on the field's right side. (See Section 1.3.6.4 for details on the use of spinners.)

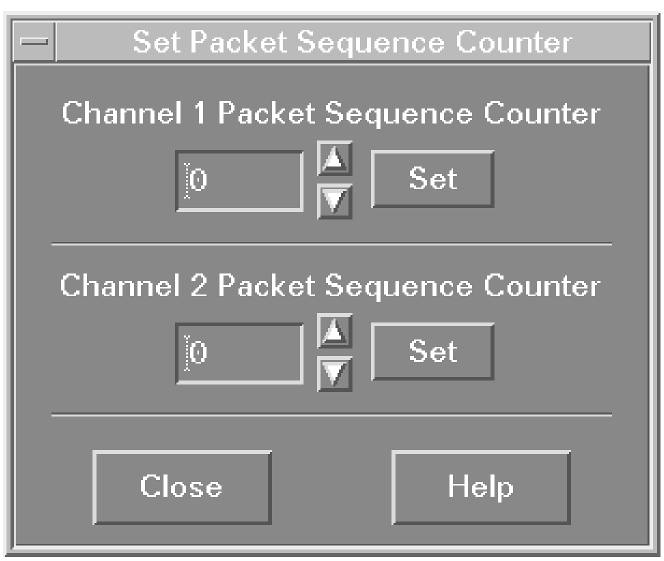


Figure 2-30. Set Packet Sequence Counter Dialog Box

To establish your changes to the packet sequence counter for a channel, click on the **Set** pushbutton for that channel.

To close the Set Packet Sequence Counter dialog box, click on **Close**.

2.4.4 MPS Configure Menu Functions

The MPS Configure menu options allow you to configure MPS processing in various ways.

2.4.4.1 Packet Format

The *Packet Format* menu option in the MPS Configure menu allows you to configure the formats of the telemetry packets that MPS generates. The Packet Format Configuration dialog box (Figure 2-31) allows you to specify the data type and encoding for each telemetry output channel, and to set header field corruption flags.

For data type, select **HK** for housekeeping data, **H&S** for health and safety data, **Diag 1K** or **Diag 16K** for diagnostic data, or **Standby** for standby data.

For encoding, select **R/S** for Reed-Solomon encoding. To corrupt or cancel Reed-Solomon encoding, select or deselect the **Corrupt** check button next to the **R/S** radio button (this causes the R/S portion of the VCDU to be calculated incorrectly). (*Caution*: The options **Diff**, for differential encoding, and **Conv**, for convolutional encoding, exist for future use. Selecting one of these will only disable Reed-Solomon.)

To corrupt a header field, select the check button for that header field. MPS corrupts four fields by setting them to erroneous values, as shown in Table 2-3.

Spacecraft ID	3A
VCID	7
Header ptr	3 (first header pointer in VCDU)
Version	3 (version number in VCDU)

Table 2-3. Erroneous Values for MPS Packet Format Corruption

To cancel the corruption of a header field, deselect its check button.

To configure the packet formats and close the dialog box, click on **OK**. To close the dialog box without making any changes to the packet format configuration, click on **Cancel**.

MPS places dump data in the telemetry Diagnostic 1K and Diagnostic 16K formats. You may dump via either the I channel (Channel 1) or the Q channel (Channel 2), but not at the same time. If

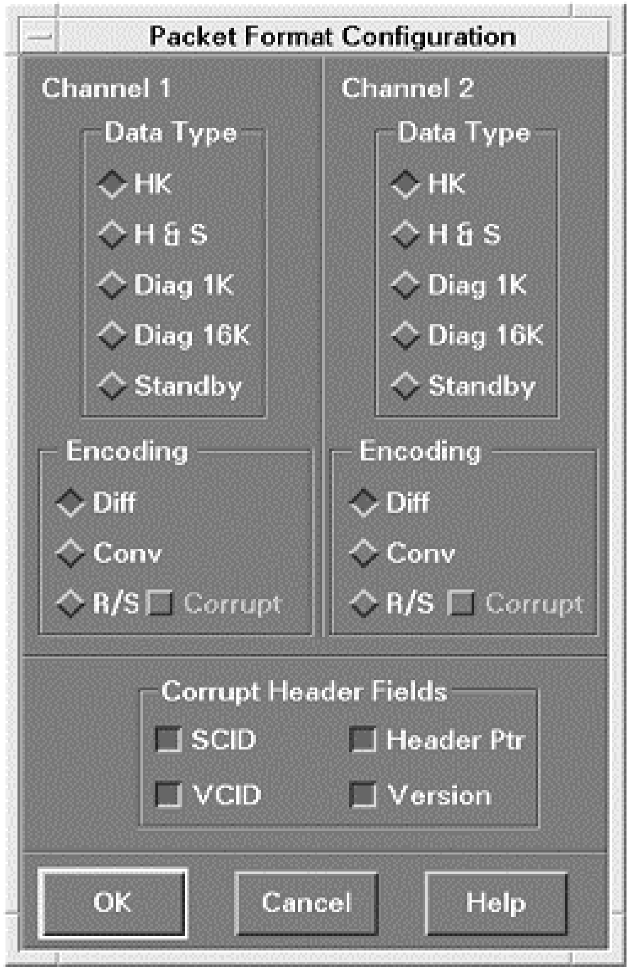


Figure 2-31. Packet Format Configuration Dialog Box

you select a diagnostic format for both channels, MPS will use the Q channel (Channel 2). To dump data to the I channel only, set the packet format for the Q channel to HK, H&S, or Standby.

2.4.4.2 Command

The *Cmd* menu option in the MPS Configure menu allows you to change the configuration of MPS command reception. MPS uses different command configurations in its two simulation modes. When you choose *Cmd*, MPS automatically displays the dialog box for the current simulation mode.

2.4.4.2.1 Spacecraft Simulation Mode

The Command Configuration – Spacecraft Sim Mode dialog box (Figure 2-32) allows you to select the HSIO card for the communications mode being used in the simulation.

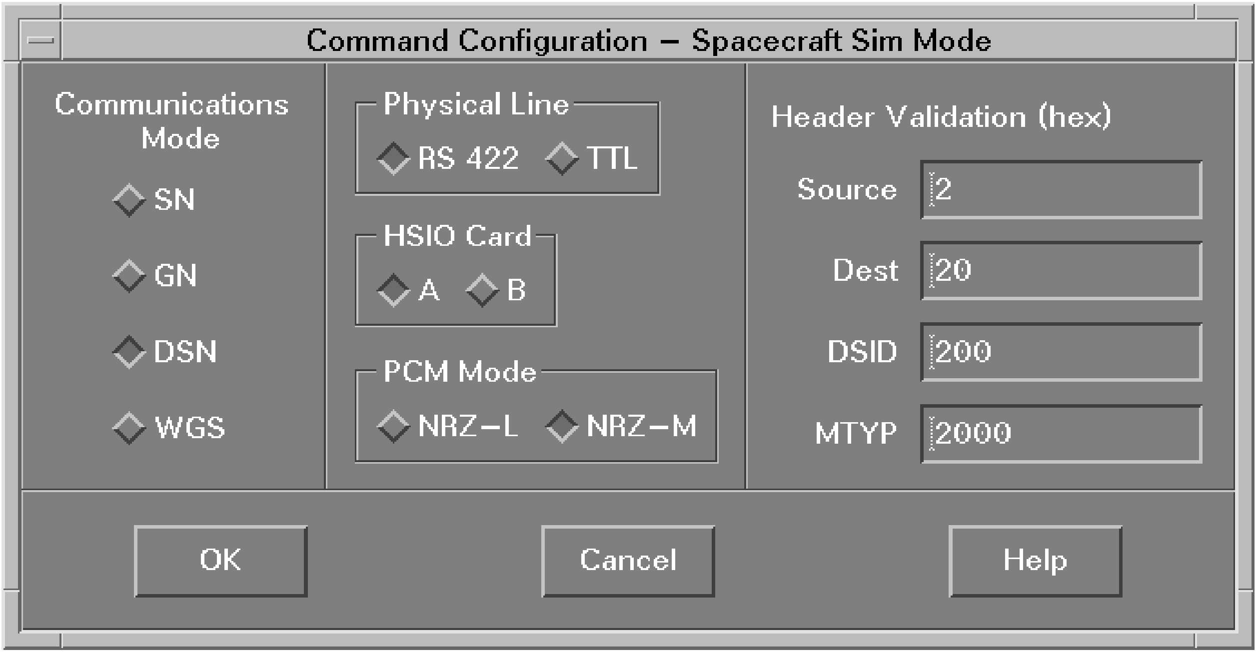


Figure 2-32. Command Configuration - Spacecraft Sim Mode Dialog Box

In spacecraft simulation mode, MPS can accommodate four communications modes. However, AM-1 requires only the Space Network (SN) mode, and you should use this one with MPS.

To specify SN communications mode, click on the **SN** radio button in the "Communications Mode" group. The Header Validation area will be dim because SN mode does not involve any transmission headers added to the serial data stream.

To use the specified command configuration and close the dialog box, click on **OK**. To close the dialog box without using or saving any configuration changes you have made, click on **Cancel**.

2.4.4.2.2 EDOS Simulation Mode

The EDOS simulation mode command formats are simpler than for spacecraft simulation mode. The Command Configuration – EDOS Sim Mode dialog box (Figure 2-33) allows you to set the validation individually for each field in the EDOS ground message header attached to the EOC command data blocks. After you turn on validation for a field, enter the value that the field is expected to have.

The header validation information involves five fields:

- **Source**: identification code for the originator of the message (e.g., 1=EDOS, 4=EOC)
- **Dest**ination: identification code for the recipient of the message
- **S/C ID**: spacecraft identification for mission associated with this message (hex 42=AM-1)

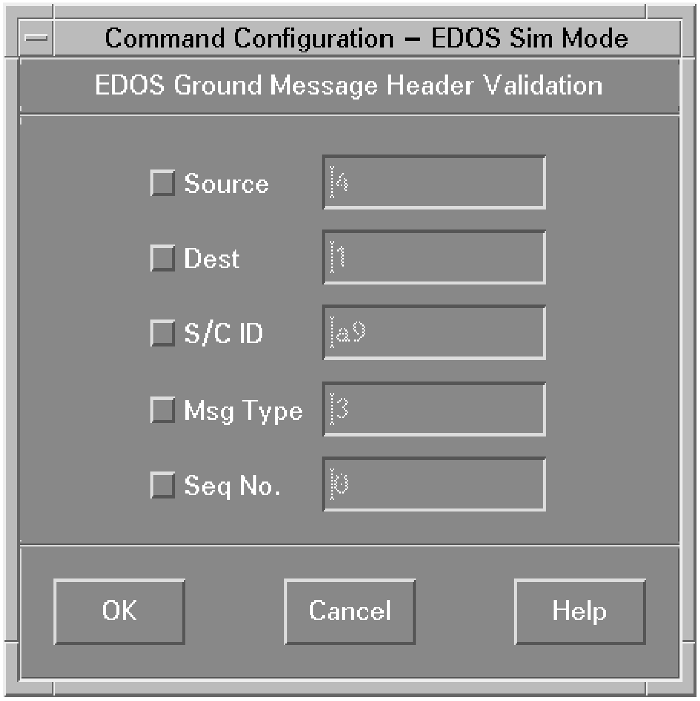


Figure 2-33. Command Configuration - EDOS Sim Mode Dialog Box

- **Msg Type**: unique identifier for message, message format indicator (3=command data block)
- **Seq No.**: one-up counter (to 65,535) per source identification; assigned by message originator

Section 5.1.2.1 of the EDOS-EGS ICD provides more complete descriptions of these fields.

To turn validation on or off for a specific field, click on the check button to the left of the field name. Into each text field, enter the expected value in hexadecimal. MPS will compare these values against the respective fields in incoming command data blocks. If the actual value does not match the expected value, MPS adds an error message to the system log and processes the command anyway.

To use the specified command configuration and close the dialog box, click on **OK**. To close the dialog box without using or saving any configuration changes you have made, click on **Cancel**.

2.4.4.3 CMD Validation

The *Cmd Validation* menu option in the MPS Configure menu allows you to control command validation. The Command Validation dialog box (Figure 2-34) provides for turning six command validation options on or off.

To turn on all the available validation options that are relevant to the current simulation and transmission modes, click on the **Set All** pushbutton. To turn them all off, click on **Clear All**.

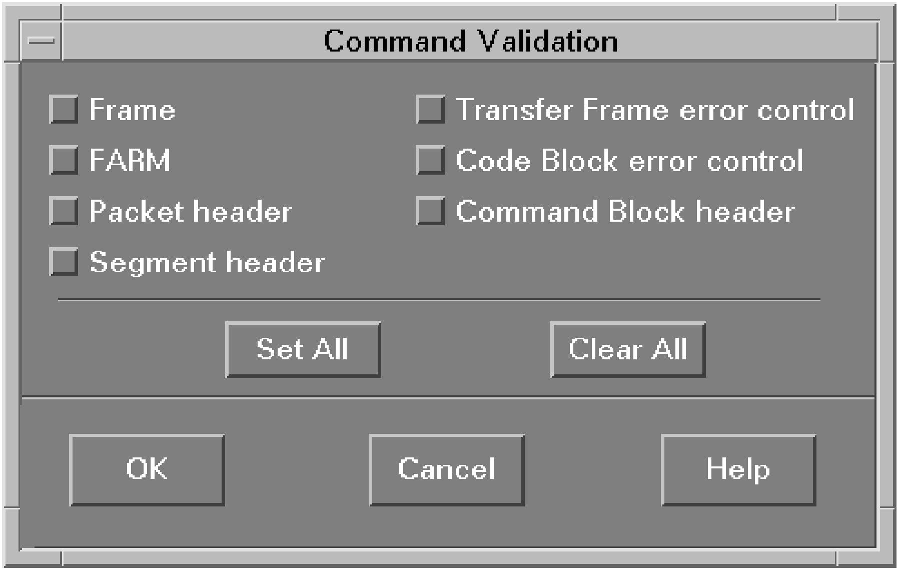


Figure 2-34. Command Validation Configuration Dialog Box

To validate the various CLTU transfer frame header fields (frame length, version number, spacecraft ID, VCID, bypass flag, and control command flag) click on the **Frame** check button.

To validate the CLTU frame sequence number, click on the **FARM** check button.

To validate the CLTU packet length, click on the **Packet Header** check button.

(The **Segment Header** check button is not used in MPS.)

To validate the CLTU transfer frame error control (TFEC), click on the **Transfer Frame error control** check button.

To validate the CLTU code block error control bits, click on the **Code Block error control** check button. The Code Block validation option is available only when MPS is operating in spacecraft simulation mode and in GN, DSN, or WGS communications mode (see Section 2.4.4.2.1). This check button is dim otherwise.

To validate the Nascom 4800-bit block header, click on the **Command Block header** check button.

To use the specified command validation configuration and close the dialog box, click on **OK**. To close the dialog box without using or saving any changes you have made to the configuration, click on **Cancel**.

2.4.4.4 CLCW

The *CLCW* menu option in the MPS Configure menu allows you to override the current value of the CLCW. The CLCW Configuration dialog box (Figure 2-35) allows you to set or reset individual bit values of the third CLCW octet or to enter a hexadecimal value for any of the four CLCW octets.

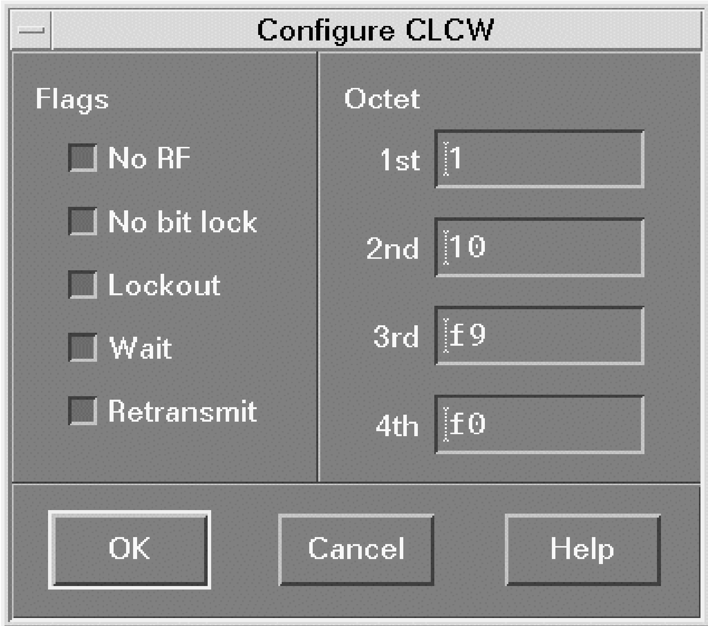


Figure 2-35. CLCW Configuration Dialog Box

Use the left side of the CLCW Configuration dialog box to set or clear individual bit values (CLCW flags) separately. To set a flag (bit = 1), select the respective check button; to clear a flag (bit = 0), deselect its check button.

Use the right side to enter hexadecimal values for any of the four CLCW octets. For the first octet, the last two bits are considered spares in the actual spacecraft implementation. MPS ignores any value you enter for these bits and sets them to zero.

When the bit flag settings and 3rd octet values differ, MPS will use the last settings/value you entered and will change the corresponding value/settings to match. When you set or clear a flag, the 3rd octet value will change to correspond to the settings. When you enter a value for the 3rd octet, the flags will be set or cleared to reflect the 3rd octet value you have entered. (The correspondence between the toggled bit variables and CLCW field names is documented in Section 5.5 of the EDOS-EGS ICD.)

To configure the CLCW flags and octets as indicated, click on **OK**. To cancel your modifications without making any changes, click on **Cancel**.

2.4.4.5 HSIO Card

The *HSIO* menu option in the MPS Configure menu allows you to configure one or both of the High-Speed Input/Output (HSIO) cards, which are used to transmit telemetry and receive commands in MPS's spacecraft simulation mode. The HSIO Configuration dialog box (Figure 2-36) allows you to set features of output for HSIO cards A and B.

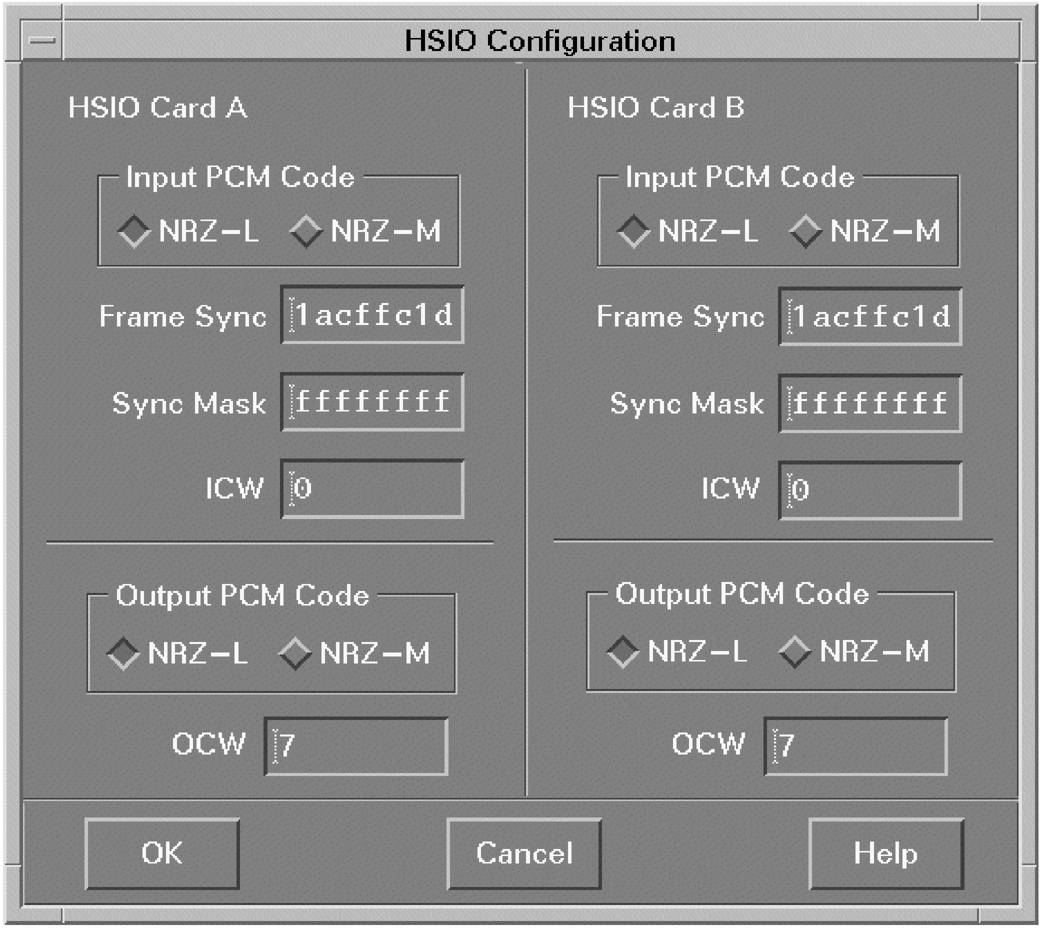


Figure 2-36. HSIO Card Configuration Dialog Box

Currently, MPS ignores any changes you make to the HSIO input features. This involves all the fields in the top half of the HSIO Configuration dialog box — Input PCM Code, Frame Sync, Sync Mask, and input control word (ICW). Instead, to configure the HSIO card selected for input, you should use the Command Configuration - Spacecraft Sim Mode dialog box (Figure 2-32, Section 2.4.4.2.1).

To configure the HSIO cards for telemetry output, set the output PCM code by clicking on the **NRZ-L** or **NRZ-M** radio button. Normally, this is all you will need to do, because selecting the PCM code sets appropriate bits in the output control word (OCW) so that you do not need to do it manually.

Because errors in the settings will produce unpredictable results, it is not advisable to adjust the OCW. However, if you do need to change it, use the bit settings listed in Table 2-4, below. To set the OCW for HSIO output, enter the hexadecimal values into the text field. The default value for NRZ-L output data is x0007; for NRZ-M, x0207. The default settings are restored when the MVME-177 and HSIO cards are rebooted.

For more information, see the HSIO user's guide.

Bits 1 2 3 4 0 0 0 0	5 6 7 8 0 x x x	9 10 11 12 x x x x	13 14 15 16 x 1 1 1
bits 1-5	Always zero		
bits 6-8	Selects output code: 000 = NRZ-L 100 = BIO-L 001 = NRZ-S 101 = BIO-S 010 = NRZ-M 110 = BIO-M		
bit 9	Selects idle pattern: 0 = zero idle pattern 1 = alternating one-zero output		
bits 10-11	Selects clock divisor: 00 = 1x clock divisor 01 = 1x clock divisor 10 = 2x clock divisor 11 = 3x clock divisor		
bit 12	Selects odd/even number of frame: 0 = even number 1 = odd number		
bit 13	0 = selects MSB data first 1 = selects LSB data first		
bit 14	0 = selects byte mode 1 = selects word mode		
bit 15	0 = runs on FIFO almost empty 1 = runs on FIFO full		
bit 16	0 = DMA not used 1 = DMA used		

Table 2-4. Bit Settings for the HSIO Output Control Word

To use the specified HSIO configuration and close the dialog box, click on **OK**. To close the dialog box without using or saving any changes you have made to the configuration, click on **Cancel**.

2.4.4.6 TLM

The *Tlm* menu option in the MPS Configure menu lets you configure MPS to generate telemetry. MPS uses different telemetry configurations in its different simulation modes. When you choose the *Tlm* option, MPS automatically presents the dialog box for the current simulation mode.

2.4.4.6.1 Spacecraft Simulation Mode

The Telemetry Configuration – Spacecraft Sim Mode dialog box (Figure 2-37) allows you to configure each channel to generate telemetry data in spacecraft simulation mode.

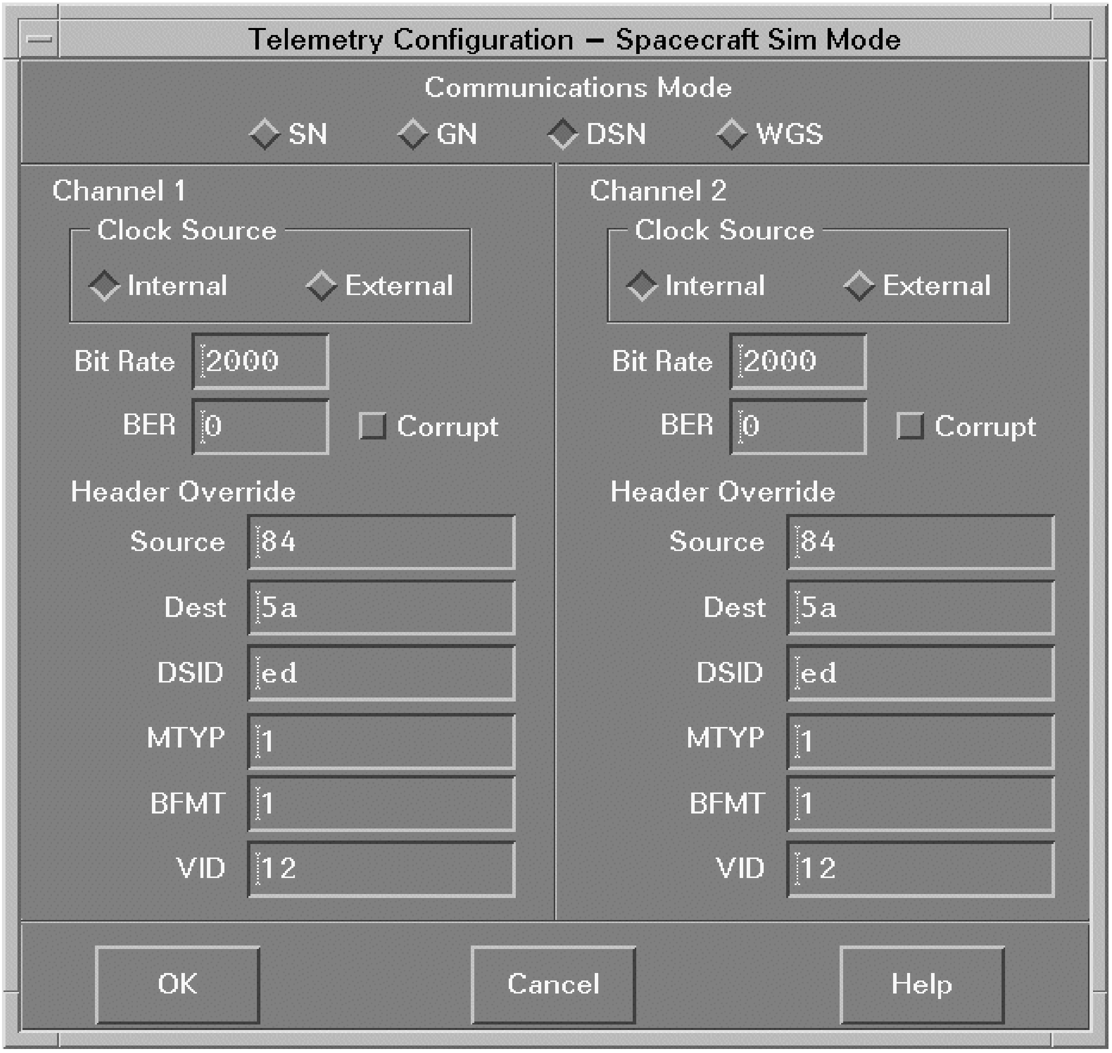


Figure 2-37. Telemetry Configuration - Spacecraft Sim Mode Dialog Box

To select a telemetry communications mode, click on the radio button for the **SN** (Space Network). SN is the only communications mode used for AM-1.

For each channel, specify the clock source and the bit rate and error characteristics.

Data transmission requires a clock to be the source of timing information. To use the internal clock source, click the **Internal** check button and enter the **Bit Rate** in number of bits per second. (For example, for a 16Kbps data format, enter 16000.) MPS can also accept an external clock source, although cables into the HSIO card would need to be configured. (For assistance with connecting an external clock source, see the MPS system administrator.)

The bit error rate (BER) is the rate at which telemetry is to be corrupted (i.e., “n” means “invert every n^{th} bit”). To generate corrupt telemetry, enter a value greater than zero in the “BER” field. MPS automatically sets the **Corrupt** check button to reflect that telemetry is being corrupted.

Note: To generate corrupt telemetry, do not click on the **Corrupt** check button. You must enter a BER value. The **Corrupt** check button will remain unset while the BER value remains zero.

To cancel generation of corrupt telemetry, deselect the **Corrupt** check button or enter "`0`" into the "BER" text field. MPS automatically sets the other (text field or check button) to reflect your action.

To use the specified telemetry configuration and close the dialog box, click on **OK**. To close the dialog box without using or saving any changes you have made to the configuration, click **Cancel**.

2.4.4.6.2 EDOS Simulation Mode

Telemetry formats for EDOS simulation mode are simpler than for spacecraft simulation mode. The Telemetry Configuration – EDOS Sim Mode dialog box (Figure 2-38) allows you to configure, for each channel, the overrides for the EDOS Service Headers (ESHs).

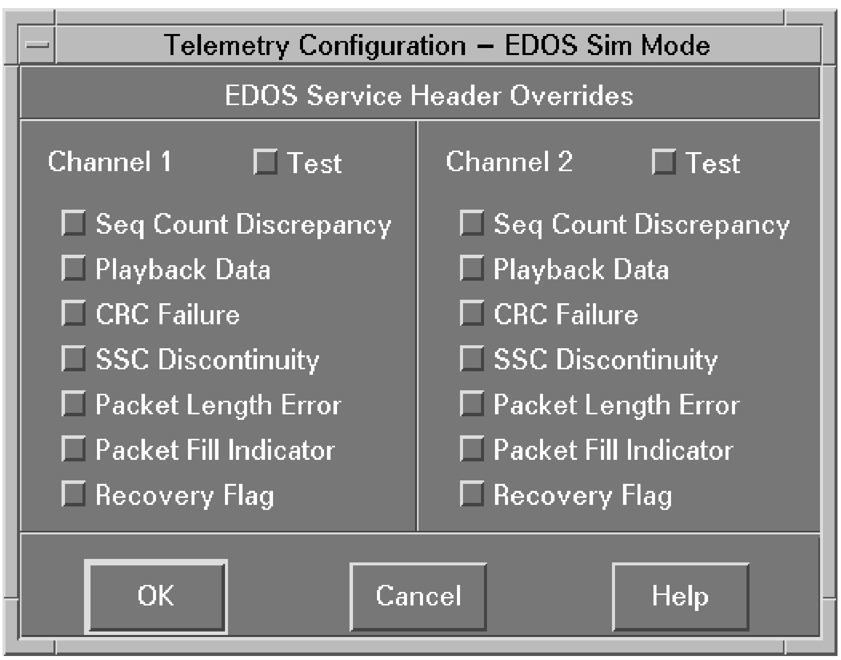


Figure 2-38.   Telemetry Configuration - EDOS Sim Mode Dialog Box

The EDOS Service Header is defined in the EDOS-EGS ICD. For each telemetry channel, you can set and unset eight of the one-bit indicators contained in the ESH. In addition to the test data indicator, you can use this dialog box to set seven one-bit fields: source VCDU sequence counter discontinuity (item 5 in the ESH), playback data indicator (item 6), CRC failure indicator (item 9), path SDU source sequence counter (SSC) discontinuity (item 10), packet length error (item 11), packet fill indicator (item 12), and recovery processing indicator (item 7). A header bit field will have a value of 1 if its check button is selected; it will have a value of 0 if its check button is not selected.

MPS also has a set of user commands to adjust the Reed-Solomon error control flag (item 17) in the ESH of MPS packets. (See Appendix C.2 for details.)

To use the telemetry configuration and close the dialog box, click on **OK**. To close the dialog box without using or saving any telemetry configuration changes you have made, click on **Cancel**.

2.4.4.7 TLM Packet

The *Tlm Packet* menu option in the MPS Configure menu allows you to set or override specific telemetry values. At initialization, MPS sets all discrete and analog telemetry parameters to specific values, using information taken from the PDB (See Section A.4 in Appendix A). The Telemetry Packet Configuration dialog box (Figure 2-39) allows you to change some specific telemetry values without having to create or run a scenario file, or to set a value in all telemetry packets by offset.

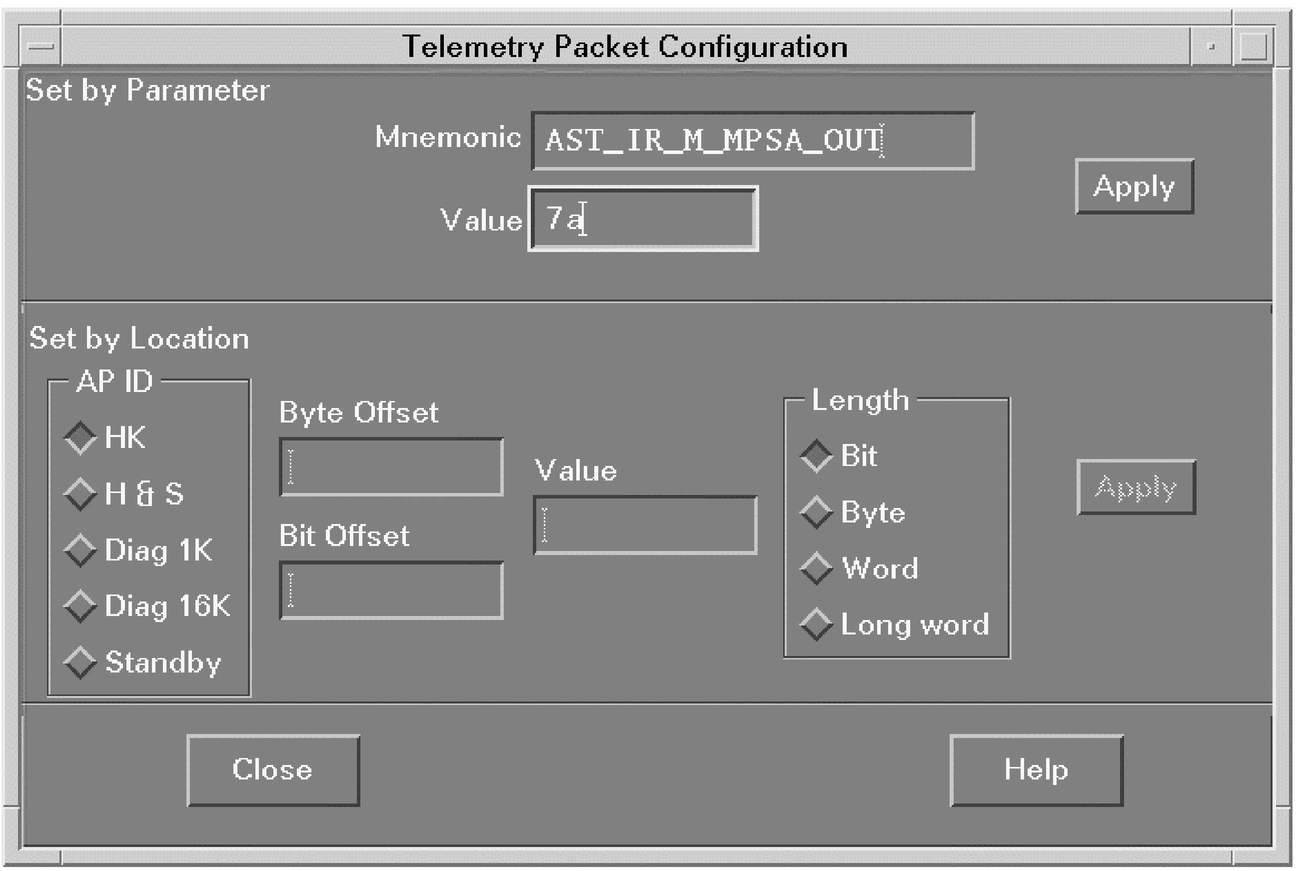


Figure 2-39. Telemetry Packet Configuration Dialog Box

Use the upper area of this dialog box to set the value of a specific telemetry parameter. Enter the mnemonic name of that parameter into the “Mnemonic” field, and enter the parameter’s desired raw value (in hexadecimal) into the “Value” field. To set that value for the parameter, click on the **Apply** pushbutton. MPS will attempt to set this value in all telemetry packets of all application process identifiers (APIDs) in which the specified telemetry mnemonic appears, as defined in the PDB.

Two messages will appear in the status log area of the MPS main window. The first indicates that MPS has accepted the request and is searching the PDB for the telemetry mnemonic. The second messages indicates the results of the search: (1) the update has been completed successfully, (2) the telemetry mnemonic was not found in the PDB and no update has been performed, or (3) the value you entered was too large to fit into the field reserved for that telemetry parameter and no update has been performed. If the telemetry node was not found, it means either that the mnemonic is somehow missing from the PDB or that there was a typographical error in your entry.

You may set 1750A parameters either via the Telemetry Packet Configuration dialog box (hexadecimal values) or via the U_SET1750 user command (floating point; see Appendix C). However, there are two limitations to using the dialog box. First, MPS performs no error checking on parameters you set this way. For example, disallowed numbers such as 0x00000F, which translates to zero times two to the 16th power, may be entered and will not be caught. Second, you may use the dialog box only to set the first 32 bits of a 48-bit parameter; the remaining 16 bits are not defined. To set all 48 bits, you *must* use the user command.

Alternatively, you can use the lower area of the dialog box to set a value by specifying a particular location in which the value will be placed. This method of setting telemetry parameter values is not recommended, however. The offsets of the telemetry parameters change from one major frame to the next, and most telemetry parameters do not appear in all major frames. These factors make it very difficult to match the location with the desired parameter.

To select an APID, click on one of the radio buttons **HK** (housekeeping), **H&S** (health and safety), **Diag 1K** or **Diag 16K** (diagnostic, depending on rate), or **Standby**. Enter decimal values for the byte and bit offsets from the beginning of the CCSDS packet header, and enter the desired hexadecimal value for the telemetry parameter in the “Value” field.

Specify the length of the data area into which the value is to be placed. To select the length, click on the **Bit**, **Byte**, **Word** (2 bytes), or **Long word** (4 bytes) radio button. To set that value for the selected location, click on the **Apply** pushbutton. MPS will insert this value into all major frames of the telemetry APID selected at the offset given, regardless of whether telemetry parameter information is present. Because **Byte offset** and **Bit offset** begin at zero, you can use this function to set packet header values. (Bit offset is used only when the **Bit** length is selected.)

An explanation of **Bit offset** and **Bit length**: Although the EOS-AM1 project defines telemetry parameter positions in bits from the beginning of the packet (counting from 1), hardware constraints require MPS to define offsets in bytes and bits (counting from 0). Further, the MVME-177 and the C language compiler count bits from the rightmost (least significant) bit of a byte. The formula is:

Byte offset = (integer part of offset - 1) / 8

Bit offset = 7 – ((remainder of offset / 8) * 8)

For example, to set bit 114 of the packet, divide 113 by 8 to get the byte number (14), then multiply the remainder (0.125) by 8, and subtract that result from 7 to get the bit number (6). Enter the values obtained into **Byte offset** and **Bit offset.**

If you set a value by one method (e.g., mnemonic) and then set the same value by the other method (e.g., packet location), MPS uses the most recent setting.

You can use the Telemetry Packet Configuration dialog box to modify any number of telemetry values. Every time you click the **Apply** pushbutton, MPS accepts the value you have just entered, and you are free to enter another parameter value by name or position.

Note: To use a telemetry value you've entered, you *MUST* click on **Apply** before closing the dialog box. If you close the dialog box or enter another parameter name without clicking on **Apply** for a parameter value you've entered, MPS ignores the previously entered value.

To close the dialog box, click on **Close**.

2.4.4.8 Spacecraft Buffer

The *SC Buffer* menu option in the MPS Configure menu allows you to set values for specific locations in the spacecraft buffer, an area of simulated spacecraft memory that is used for table or memory loads. The Spacecraft Buffer dialog box (Figure 2-40) allows you to set a value within the table or memory load (whichever is being used in the current simulation).

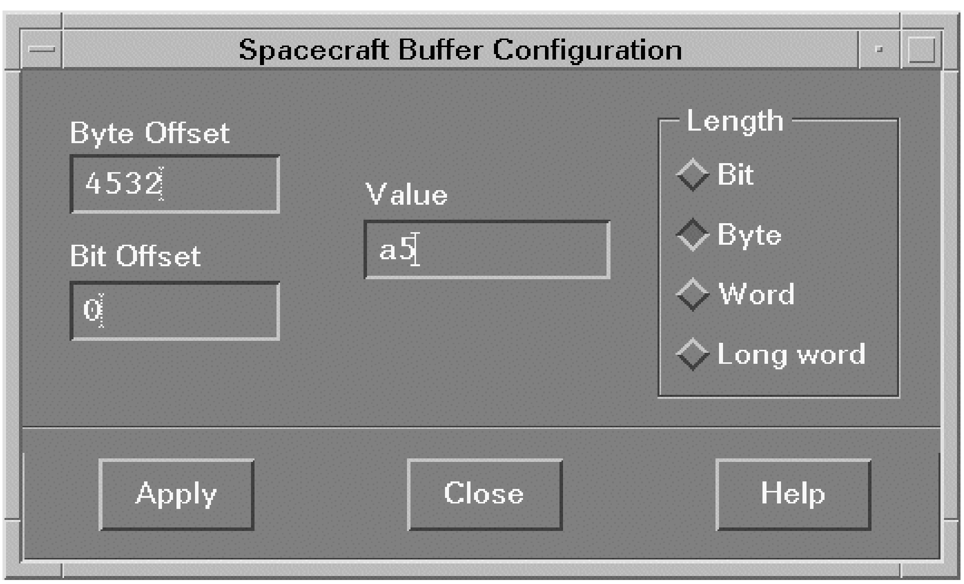


Figure 2-40. Spacecraft Buffer Configuration Dialog Box

The byte and bit offsets, value, and length are analogous to those in the Telemetry Packet Configuration dialog box (Section 2.4.4.7). Enter the desired numbers into the text fields (offsets in decimal, values in hex) and click on the radio button corresponding to the length of the spacecraft buffer location. To set the specified value and configure the spacecraft buffer, click **Apply**.

You can use the Spacecraft Buffer Configuration dialog box to modify any number of locations in the spacecraft buffer. Every time you click the **Apply** pushbutton, MPS accepts the value you have just entered, and you are free to enter another buffer location value by position.

Note: To use a buffer location value you've entered, you *MUST* click on **Apply** as soon as you enter the value. If you close the dialog box or specify another buffer location without clicking on **Apply** for a value you've entered, MPS ignores the previously entered value.

To close the dialog box, click on **Close**.

2.4.4.9 Orbit Modeling

The *Orbit Modeling* menu option in the MPS Configure menu allows you to start and stop selected modeling functions for an identified telemetry parameter. The Orbit Modeling dialog box (Figure 2-41), allows you to change the association between the orbit modeling algorithms and one or more telemetry parameters (except for 1750A parameters, which cannot be modeled). Modeling for any number of parameters can be activated and/or configured while the Orbit Modeling dialog box is on the screen.

The "Activate" section of the Orbit Modeling dialog box allows you to start and stop parameter modeling. To start modeling for a parameter, enter the mnemonic name of that parameter in the "Parameter Mnemonic" field and click on **Start**. To stop modeling for a parameter, enter its mnemonic name and click on **Stop** or press the <Return> key.

To start or stop modeling for all parameters, enter "ALL" into the parameter mnemonic field and click on the relevant pushbutton.

Note: The Parameter Mnemonic fields are not case sensitive: Because parameter mnemonics must be in all upper case, MPS converts to upper case any lower case characters you type. For example, you may enter "all" or "ALL," or even "All," and MPS will apply the start or stop to all parameters.

The Configure section of the dialog box allows you to configure modeling for one parameter at a time. Each parameter has a default table, function, and/or static value, which is given in the input rules to the modeling data base generator (see Appendix B) and which will be used by default.

To override the default setting for the parameter, click on the **Override** radio button. The modeling Type area becomes accessible. To use a table or function to model the parameter's value, click on the **Table** or **Function** radio button; then either enter the table or function name in the text field or click on the ellpisis (**...**) button for a list of available tables or functions (Figures 2-42 and 2-43), select the table or function name from the list, and click **OK**. To use a static value to model the parameter's value, click on the **Static** ratio button and enter the value in the text field.

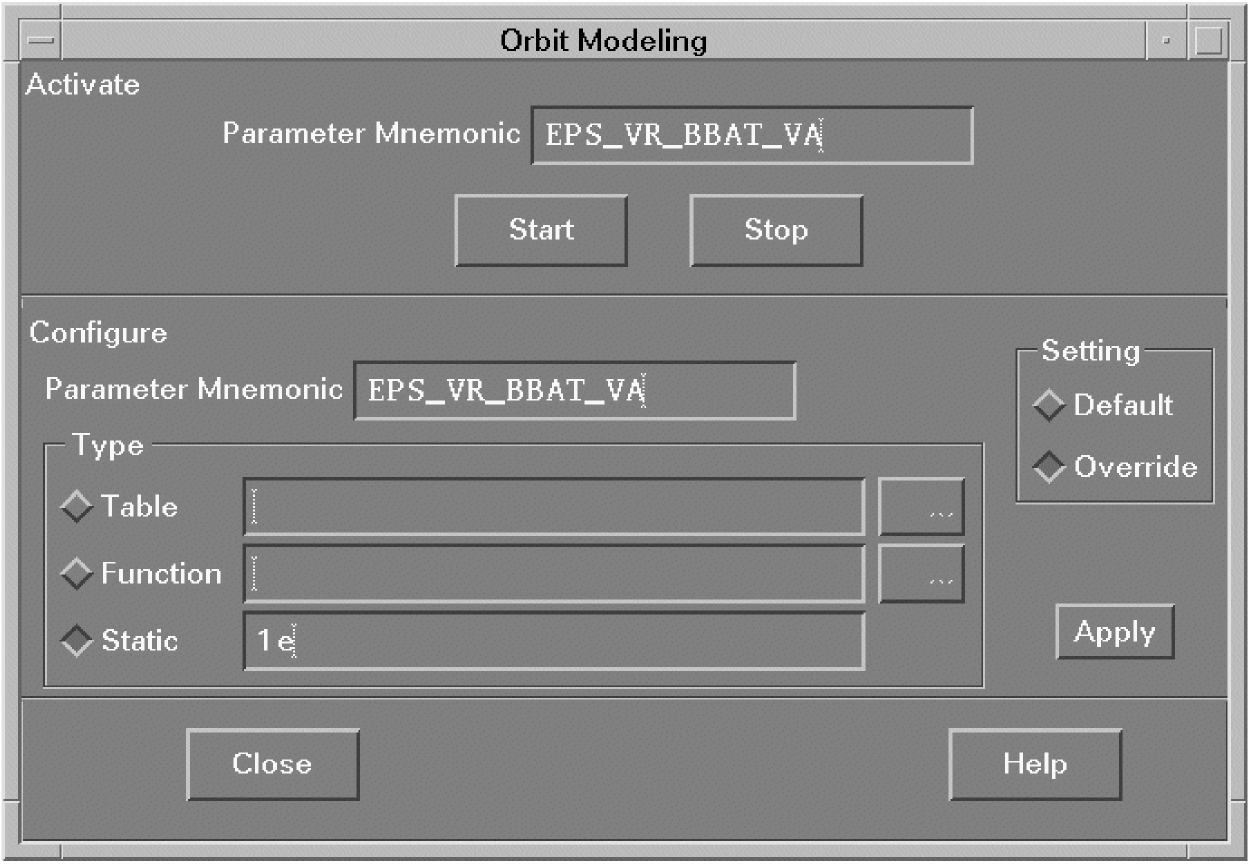


Figure 2-41. Orbit Modeling Dialog Box

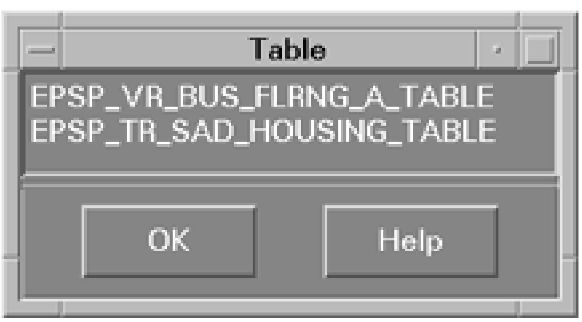


Figure 2-42. Orbit Modeling Table Dialog Box

Figure 2-43. Orbit Modeling Function Dialog Box

Note: To give you the most current lists of modeling tables and functions. MPS generates these lists when you bring up the Orbit Modeling dialog box. If you click on an ellipsis button for a table or function list that isn't ready yet, MPS displays a "Wait" dialog box (Figure 2-44). If this happens, just click **OK**, wait a few seconds, and try again.

Figure 2-44. Orbit Modeling Wait Dialog Box

To configure the specified parameter in the Orbit Modeling Dialog Box (Figure 2-41), click **Apply**.

Note: To use a modeling configuration you've entered, you *MUST* click **Apply** before closing the dialog box or entering a value for another location. If you close the dialog box or enter another parameter name without clicking on **Apply** for a modeling configuration you've entered, MPS ignores the previously entered configuration.

To set the same modeling configuration for all parameters, enter "All" into the parameter name field and enter the modeling configuration information.

To close the dialog box, click **Close**.

Note: The MPS orbit modeling process takes as its input modeling a set of configuration file, or orbit modeling data base. The modeling data base files that support this function reside on the MVME-177, and are provided by the flight operations team. MPS does not enable you to modify the modeling data base files themselves; these are generated off line via the modeling data base generator (see Appendix B). A telemetry parameter may be modeled only after it and its associated tables or functions have been included in this data base.

2.4.4.10 Network M/C Mode

The *Network M/C Mode* menu option in the MPS Configure menu allows you to set the multicast IP addresses and ports according to the network multicast mode. The selectable modes are Operational, Test, and Training/Simulation. For each multicast mode, MPS reads in a set of IP addresses and ports from system files, to use in transmitting telemetry and receiving commands in EDOS simulation mode.

When you select a mode, MPS assigns the appropriate IP addresses and ports for that mode.

The default network multicast mode is Operational.

2.4.5 MPS Monitor Menu Functions

The MPS Monitor menu provides functions for monitoring various aspects of the simulation.

Some of the monitoring options require more information from you before MPS can start the monitoring; these use a setup area or dialog box for you to define the monitoring before they begin. The other options begin the monitoring immediately.

Any delay in displaying monitored data is due to the fact that the MPS user interface process (which displays the monitored data) must communicate with the monitoring process, and the two processes execute on different platforms (the MVME-187 and -177). All of the MPS monitoring functions display the appropriate type of Monitor dialog box as soon as they begin receiving the monitored information from the MVME-177.

2.4.5.1 CMD/TLM

Each Monitor dialog box displays a hexadecimal dump of the data being monitored, and the dialog box's title reflects the specific type of data being monitored (e.g., "Command" in Figure 2-45).

2.4.5.1.1 Command

To monitor commands, select *CMD/TLM* menu from the Monitor menu (Figure 2-9) and then *Command* from the *CMD/TLM* cascade menu (Figure 2-10). MPS displays the commands in the Command Monitor dialog box (Figure 2-45) at the rate at which it receives them from the EOC.

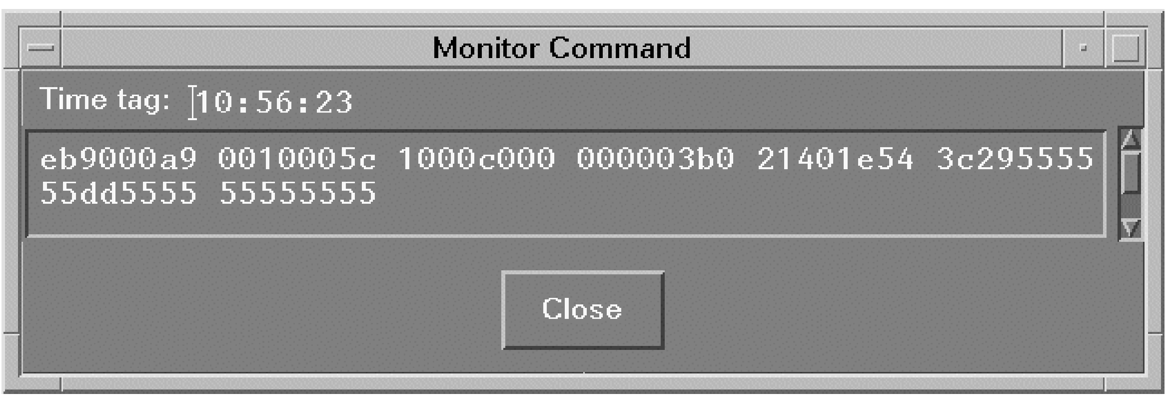


Figure 2-45. Monitor Commands Dialog Box

To close the Command Monitor dialog box and stop command monitoring, click on **Close**.

2.4.5.1.2 CLCW

To monitor CLCWs, select *CMD/TLM* menu from the Monitor menu and then *CLCW* from the *CMD/TLM* cascade menu (Figure 2-10). MPS displays the four CLCW octets in the CLCW monitor dialog box (Figure 2-46) at the CLCW update rate.

To close the CLCW Monitor dialog box and stop CLCW monitoring, click on **Close**.

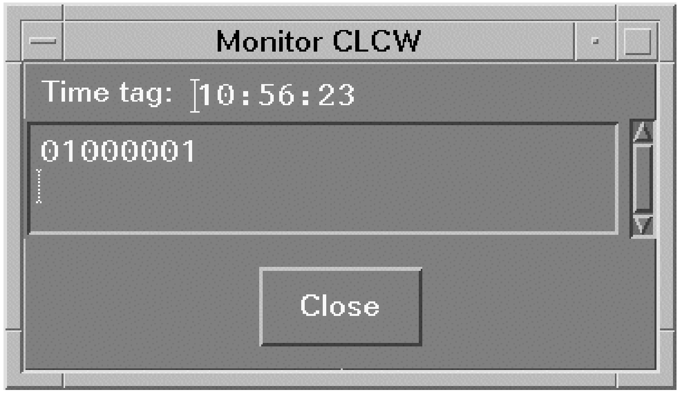


Figure 2-46. Monitor CLCW Dialog Box

2.4.5.1.3 Parameter

To monitor a telemetry parameter, select *CMD/TLM* menu from the Monitor menu and then *Parameter* from the *CMD/TLM* cascade menu (Figure 2-10). MPS displays the Monitor Parameter dialog box (Figure 2-47), to collect parameter monitoring setup information and display the telemetry parameter's value as it changes.

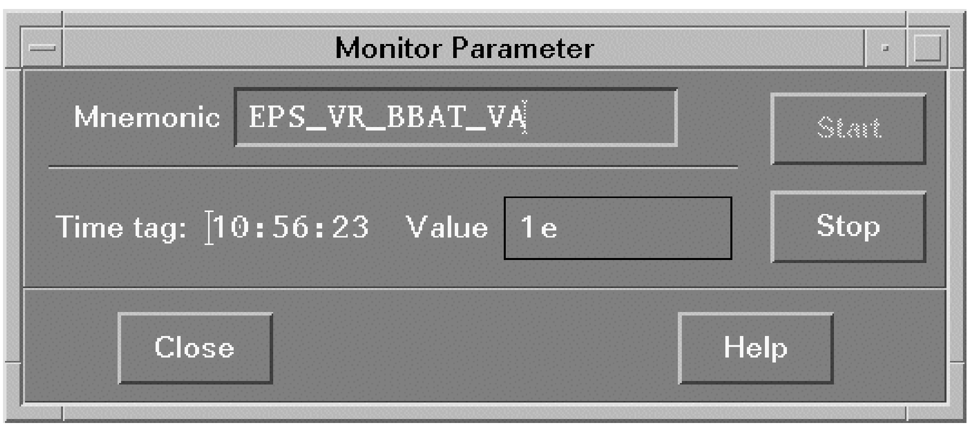


Figure 2-47. Monitor Parameter Dialog Box

Into the "Mnemonic" text field, enter the mnemonic of the telemetry parameter to be monitored. To start monitoring that parameter, click on the **Start** pushbutton. MPS displays the parameter's value and updates the display as simulator changes the value, indicating in the "Time" field the time of the most recent change in the parameter's value.

To stop parameter monitoring, click on the **Stop** pushbutton. (Note: To start monitoring a different parameter, you must first stop monitoring the current parameter. Only one parameter can be monitored at one time.)

To close the Parameter Monitor dialog box, click on **Close**. This will also stop telemetry parameter monitoring if it is active.

Note: If you have requested monitoring of a 1750A parameter, MPS will display the value of this parameter in hexadecimal in the Monitor Parameter dialog box and in floating point in the status log area of the MPS main window (see section 2.2.1).

2.4.5.1.5 VCDU

To monitor VCDUs (available only in spacecraft simulation mode), select *CMD/TLM* menu from the Monitor menu and then *VCDU* from the *CMD/TLM* cascade menu (Figure 2-10). MPS displays the VCDU Monitoring Setup dialog box (Figure 2-48) to collect VCDU monitoring setup information.

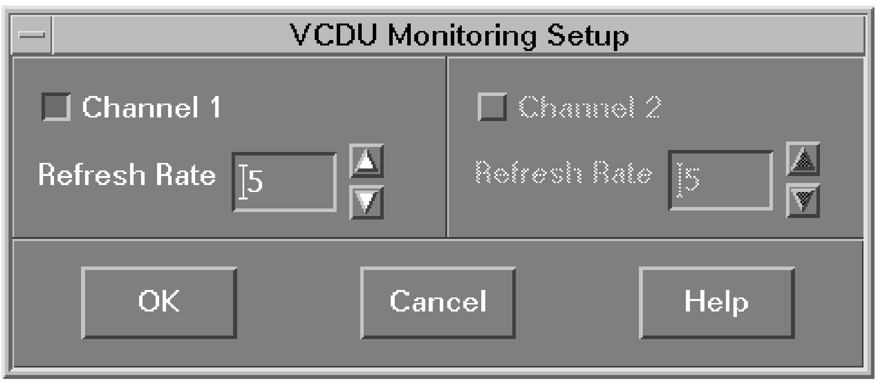


Figure 2-48.   VCDU Monitoring Setup Dialog Box

To specify that a channel is to be monitored, click on the check button for that channel. Use the "Refresh Rate" spinner to change the refresh rate for the channel to be monitored (the default rate is specified in the MPS initial parameters file). (See Section 1.3.6.4 for an explanation of how to use spinners.)

To start monitoring VCDU on the specified channel, click on **OK**. To cancel VCDU monitoring, click on **Cancel**.

During VCDU monitoring, MPS displays the VCDUs as they are monitored, using one or two VCDU Monitor dialog boxes (Figure 2-49), depending on the number of channels monitored. The VCDU information is updated at the specified refresh rate in each VCDU Monitor dialog box.

To stop monitoring VCDU for a channel and close the respective VCDU Monitor dialog box, click on **Close** in the VCDU Monitor dialog box for that channel.

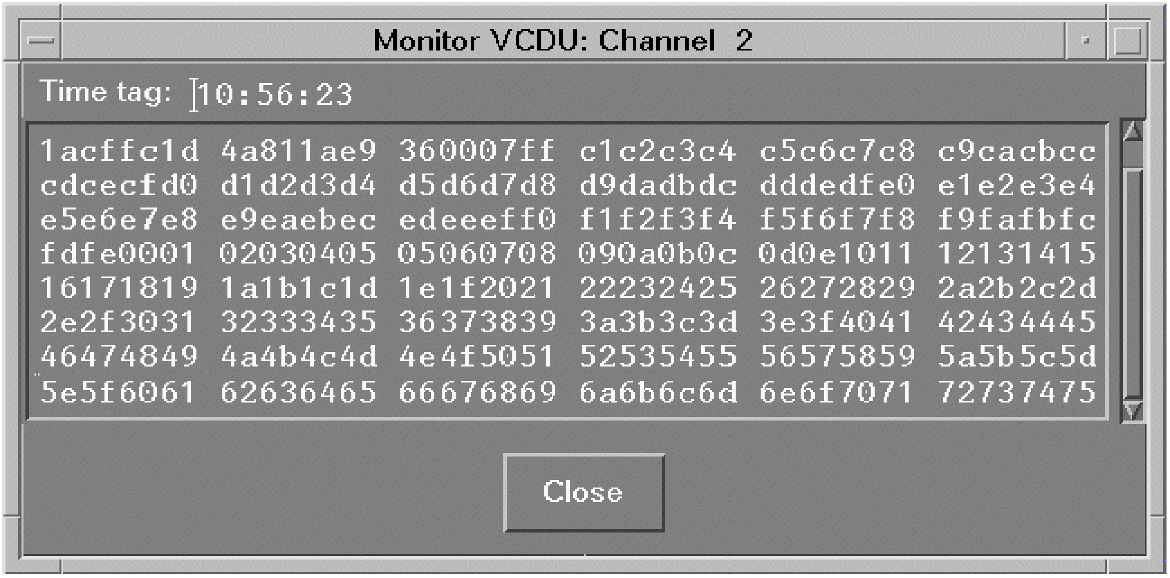


Figure 2-49. VCDU Monitor Dialog Box

2.4.5.1.6 EDU

To monitor EDUs (available only in EDOS simulation mode), select *CMD/TLM* in the Monitor menu (Figure 2-9) and then *EDU* from the *CMD/TLM* cascade menu (Figure 2-10). MPS displays the EDU Monitoring Setup dialog box (Figure 2-50) to collect additional EDU monitoring setup information.

To specify that a channel is to be monitored, click on the check button for that channel. Use the "Refresh Rate" spinner to change the refresh rate for the channel to be monitored (the default rate is specified in the MPS initial parameters file). (See Section 1.3.6.4 for how to use spinners.)

To start monitoring EDU on the specified channel, click **OK**. To cancel EDU monitoring, click **Cancel**.

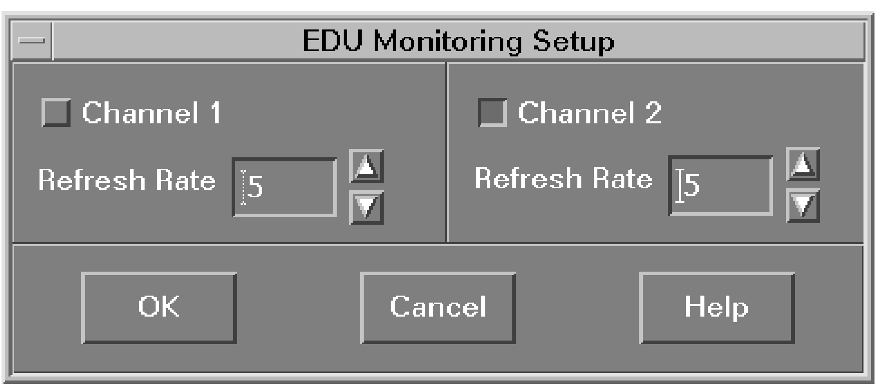


Figure 2-50. EDU Monitoring Setup Dialog Box

During EDU monitoring, MPS displays the EDUs as they are monitored, using one or two EDU Monitor dialog boxes (Figure 2-51), depending on the number of channels monitored. The EDU information is updated at the specified refresh rate in each EDU Monitor dialog box.

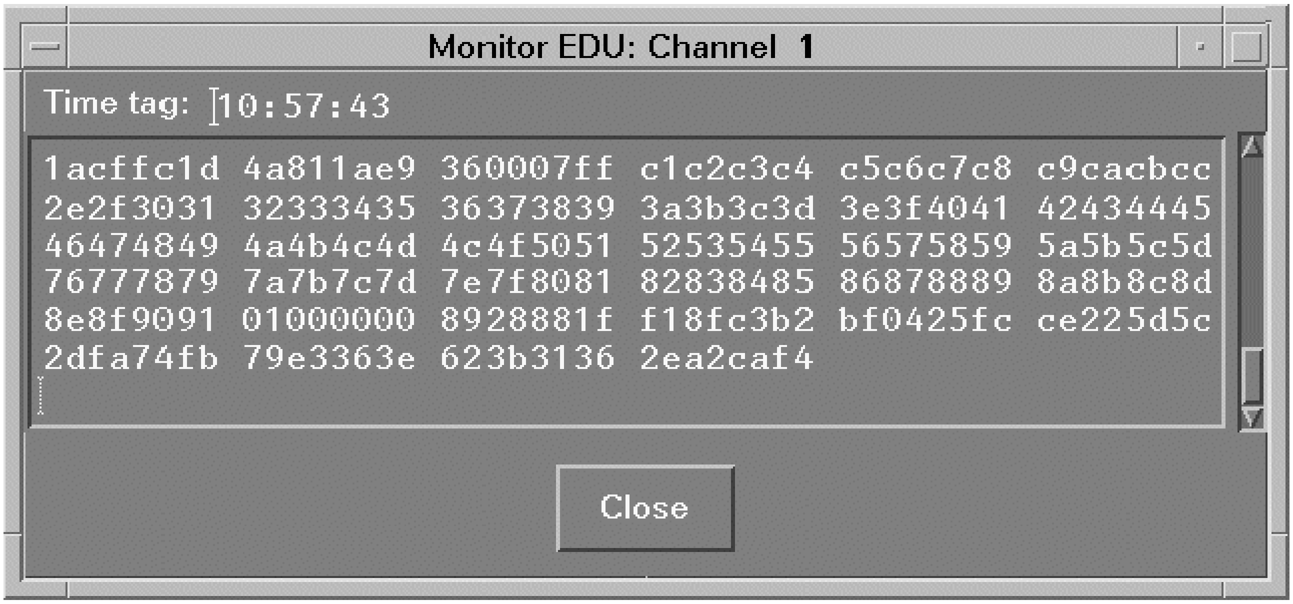


Figure 2-51.   EDU Monitor Dialog Box

2.4.5.2 Command Status

The *Command Status* option in the MPS Monitor menu allows you to monitor various aspects of command reception. The Command Status dialog box (Figure 2-52) allows you to monitor bit fields within the current CLCW, the number of commands received, and the current count of command errors. It also provides Table and Memory load and dump information.

The Command Status Monitor dialog box shows the following information:

CLCW information:

- Command counter — number of commands received since the last time the CLCW was configured (via the *CLCW* option in the Configure menu).
- Command errors — number of command errors detected since the last time the CLCW was configured (via the *CLCW* option in the Configure menu).

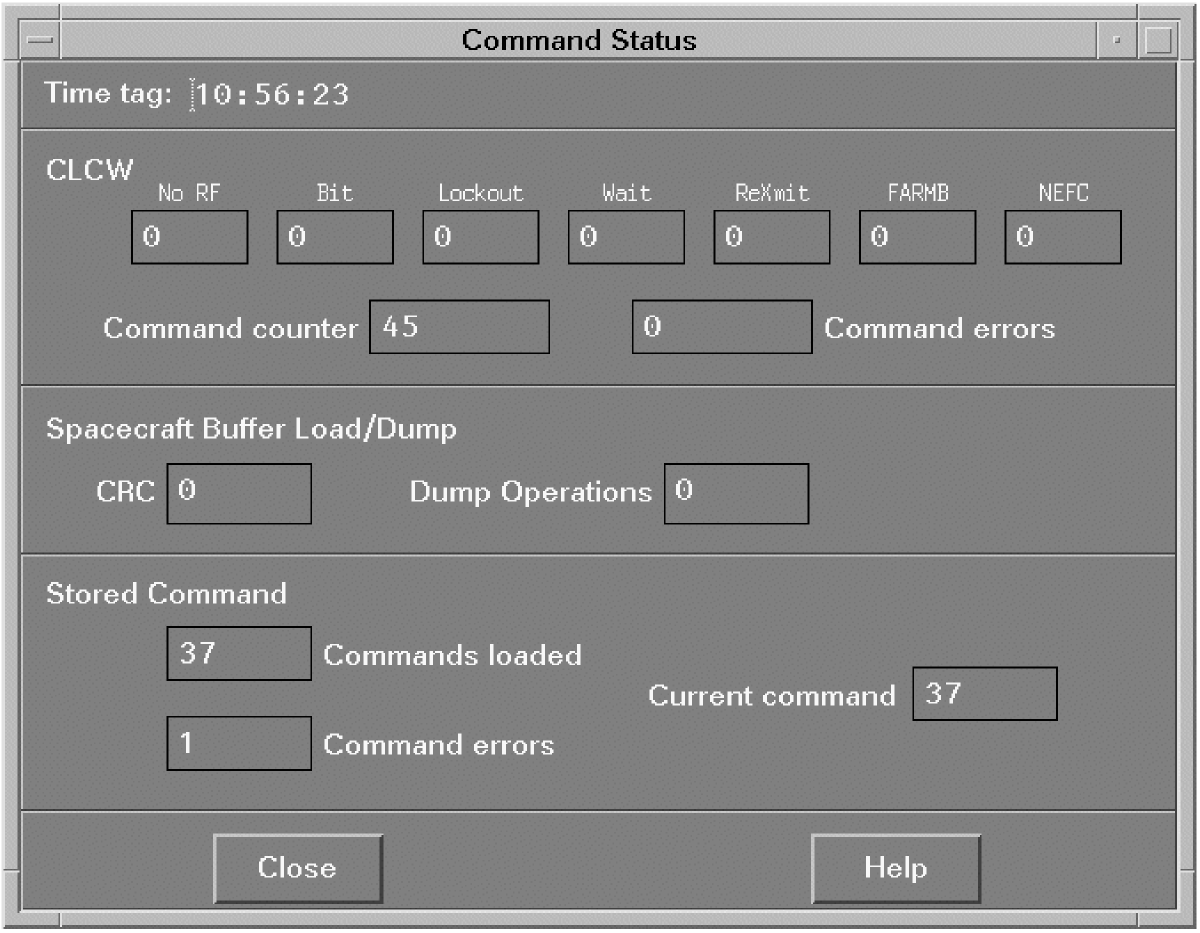


Figure 2-52. Command Status Monitor Dialog Box

Spacecraft buffer load/dump information:

- CRC — cyclic redundancy check, a parity verification indicator
- Dump operations — status of dump simulation
  - 0 - disabled
  - 1 - enabled
  - 2 - in progress
  - 3 - completed

Stored command information:

- Commands loaded — number of load requests MPS has accepted during the current session
- Current command — number of commands MPS has executed during the current session (i.e., sequence number of the last command executed)

To close the dialog box and end command status monitoring, click on **Close**.

2.4.5.3 Tlm Status

The *Telemetry Status* menu option in the MPS Monitor menu allows you to monitor various aspects of telemetry generation. MPS displays the Telemetry Status – Spacecraft Sim Mode dialog box (Figure 2-53) or the Telemetry Status – EDOS Sim Mode dialog box (Figure 2-54) to allow you to monitor telemetry channel transmission statistics and identify the status of active channel(s).

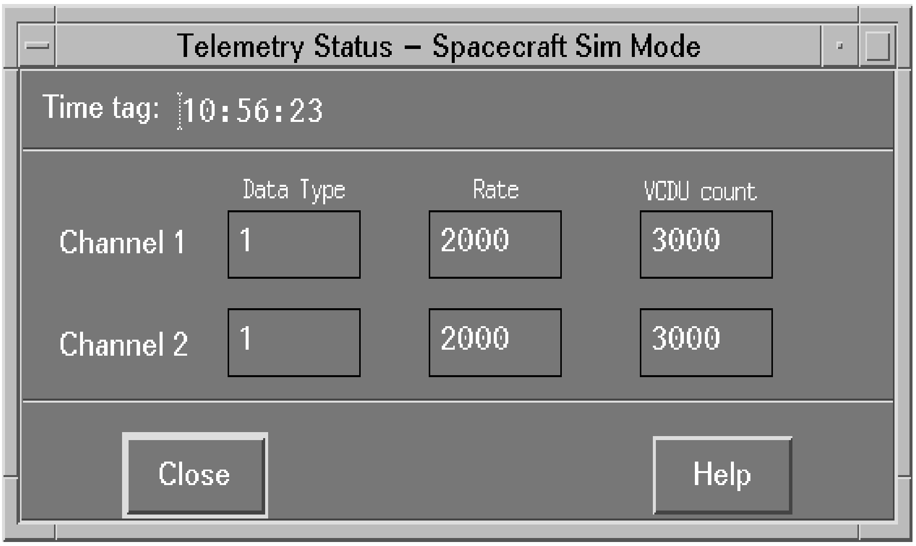


Figure 2-53. Telemetry Status Monitor Dialog Box (Spacecraft Sim Mode)

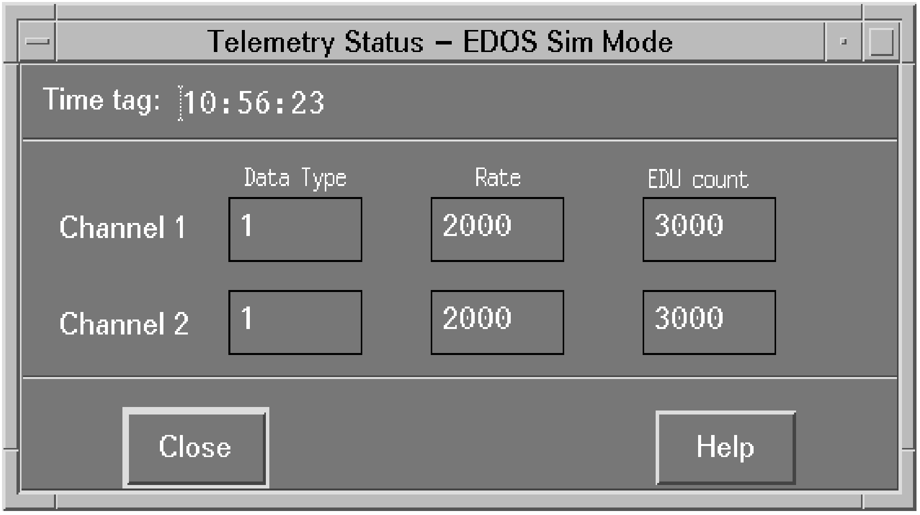


Figure 2-54. Telemetry Status Monitor Dialog Box (EDOS Sim Mode)

This dialog box shows the data type, data rate, and total count of data packets (VCDUs or EDUs) sent for each channel. In spacecraft simulation mode, MPS displays the VCDU Count; in EDOS simulation mode, it displays the EDU Count. If no telemetry is being transmitted on a channel, that channel's name is dim and its values are blank.

To stop telemetry status monitoring and close the dialog box, click on **Close**.

2.4.5.4 Network Status

The *Network Status* menu option in the MPS Monitor menu allows you to display (Figure 2-55) the current network port assignments and IP addresses for telemetry data, commands, and CLCWs used when MPS is in EDOS simulation mode. This display will update whenever the port assignments or IP addresses change — for example, when the Network Multicast Mode is changed.

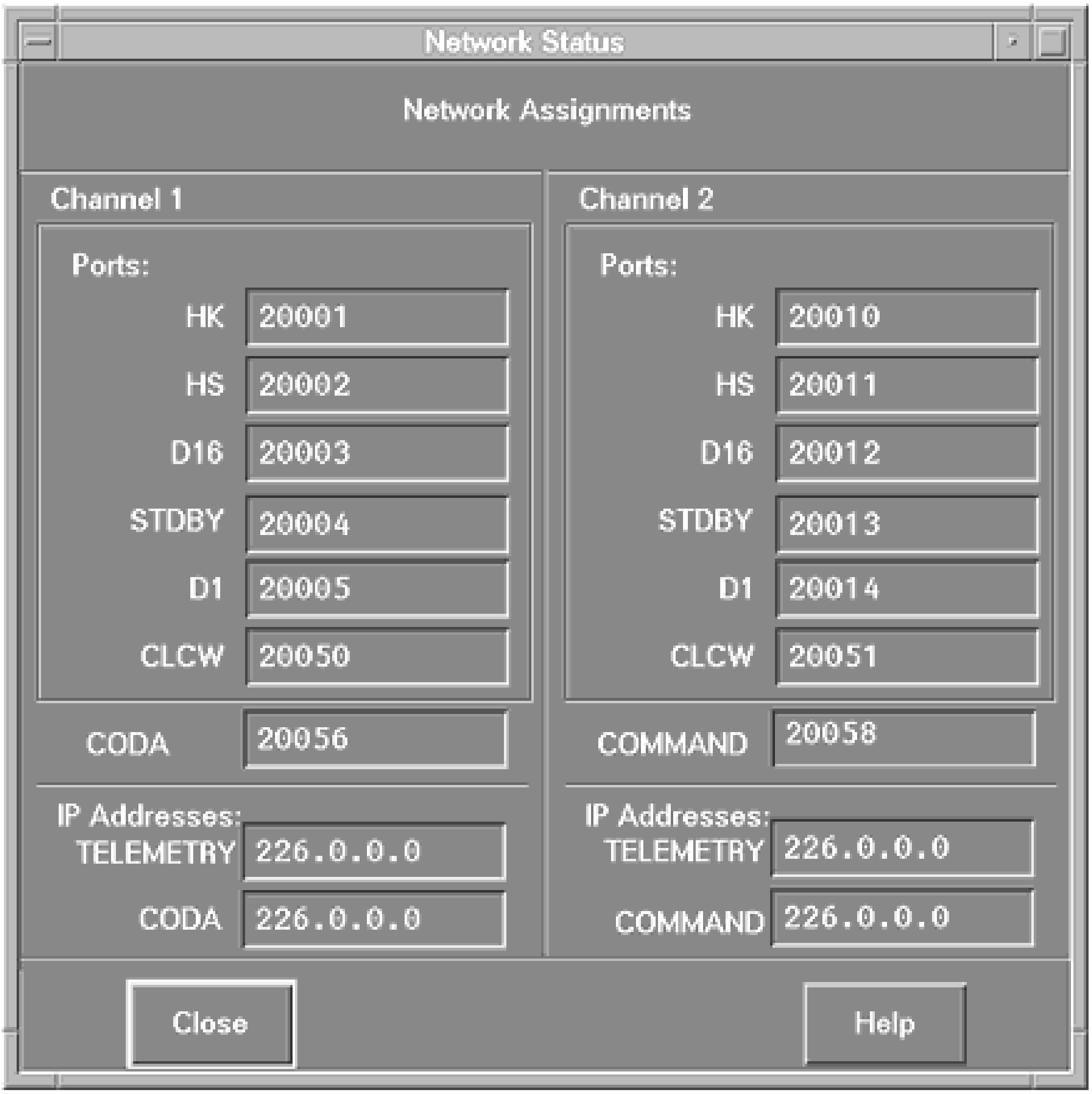


Figure 2-55. Network Status Window

To stop network status monitoring and close the dialog box, click on **Close**.

2.4.6 MPS Help Menu Functions

The MPS Help menu options allow you to get information about using the MPS main window.

2.4.6.1 About MPS

The *About MPS* menu option in the MPS Help menu allows you to get help on the MPS main window in general. When you select this option, the top-level MPS Help window appears (Figure 2-56). To close the MPS Help window, click on **Close**.

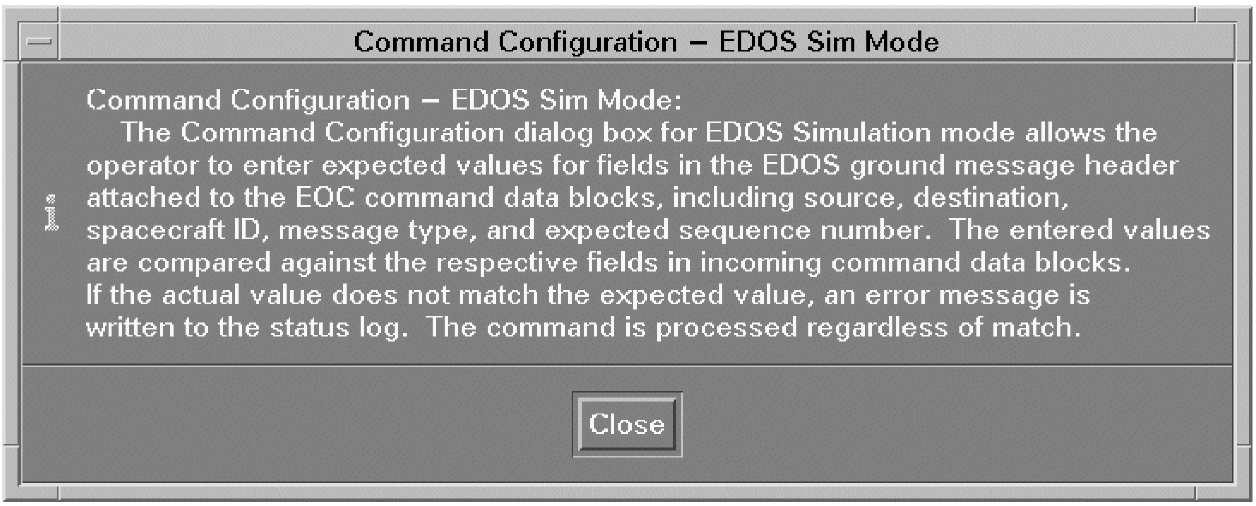


Figure 2-56. MPS Help Window

2.4.6.2 On context

The *On context* menu option in the MPS Help menu allows you to get help about a specific area of the MPS main window. The pointer changes shape to a hand with the index finger extended. To select the area of the MPS main window for which you want information, click on that area, using the tip of the index finger as the indicator.

3 - Considerations in Using MPS with EOC

3.1 Introduction

This section describes some considerations that you should keep in mind when the EOC is being operated through a connection with MPS.

MPS is a low-fidelity spacecraft simulator. As such, it cannot perform all of the functions of the EOS-AM1 spacecraft; nor can it perform those simulated functions identically to the spacecraft. This section highlights two of the key spacecraft processes, briefly discusses how MPS handles them, and explains their effects on MPS operation in conjunction with the EOC.

3.2 Loads and Dumps

MPS uses a single generic buffer for all memory load and dump operations, as well as for RTCS simulations. You, the user, are responsible for keeping track of what is loaded.

The following constraints apply to memory loads and dumps:

- The MPS buffer area is 10,000 bytes. You may not initiate a load or dump larger than this.
- MPS dumps data from the start of the buffer for a specified number of bytes. It ignores addresses, but spacecraft commands must contain correct addresses.
- MPS performs memory loading or dumping for only one remote terminal (RT) user at a time. If MPS is currently performing a memory load/dump for one RT user (e.g., CTIU1) and receives from another RT user a command to initiate a memory load or dump (e.g., CTIU2), MPS will end the load/dump function that is in progress (in this example, CTIU1) and begin the load/dump initiated by the second user (in this example, CTIU2).

3.3 Stored Commands

MPS simulates execution of stored commands on a timed basis. Command execution is limited to setting end-item verifiers and displaying session log messages. Command timing is referenced to UTC vs. spacecraft time. MPS stored-command simulation has the following constraints:

ATC

- Supports execution of 415 commands
- Begins executing as soon as the load is complete; stops when either a Halt pseudo-op is encountered or all the commands have been executed
- Does not support inhibit ID status

RTCS

- Supports execution of one RTCS
- Executes RTCSs out of a common memory data/load buffer. If an ATC and an RTCS are to be executed simultaneously, the ATC must be loaded first
- Does not support inhibit ID or inhibit ID status

This version of MPS processes only those commands that activate a stored command sequence.

Appendix A – PDB Translation for MPS

A.1 Introduction

The MPS Project Database Translator reformats Project Data Base (PDB) files received from the EOS-AM1 Project into a format usable by the Multimode Portable Simulator (MPS).

The program is capable of converting the telemetry parameter description and location files, the command parameter description and submnemonic files, the command end-item verification file, and the telemetry initial values file.

> **Note**: VME memory limitations require that the MPS simulator be shut down before the MPS PDB translator can be run. Also, the PDB translator can be executed only from the MVME-177 console.

A.2 Files

Table A-1 lists the files that the MPS PDB Translator, referred to as XPDB, requires as input and the corresponding files that it produces. The translator runs on the MVME-177 computer, and the case of the input file names is important. The “xxx” in each file name should be replaced by the three-character PDB version number.

As the table shows, the creation of end-item verifiers and initial telemetry values requires that the telemetry node, location record, discrete record, and command descriptor files be present and up to date. Therefore, those files must be created first. (See Section A.3.)

The file USER_IVALUE_FILES is optional. If it is present, it contains the names of all user-supplied initial values files.

To facilitate the use of the PDB translator with multiple versions of the AM-1 PDB, you must set up a directory structure that is similar to the following example:

```
[root] /DATABASE/ver_014
                /ver_015
```

The [root] directory may itself be a subdirectory.

The executable program xpdb belongs in the DATABASE directory, and the *.PDB source files go into the ver_xxx subdirectories, where “xxx” is the PDB version number. As XPDB executes, it writes the translated PDB files into the ver_xxx subdirectories.

As it runs, XPDB produces a history file of all operator messages. This file, named PDB_xxx.lst, is stored in the same directory as the pdb files produced and may be viewed via the PDOS ‘sf’ command, or printed if desired.

XPDB can also produce a cross-reference listing of all End-Item Verifier records generated, if you request such a listing. This file is named VERS_xxx.lst and is stored in the same directory. The file contains, for each End-Item Verifier, the mnemonic of the command, the mnemonic of the telemetry point affected, and (if discrete) the discrete-state ASCII text and associated raw data value,

Input	**Output**	**Description**
tlm_parm_xxx.PDB	tlpar.pdb	create telemetry nodes
tlm_parm_xxx.PDB	loc.pdb	create location records
tlm_dstate_xxx.PDB	disc.pdb	identify discrete telemetry points
cmd_parm_xxx.PDB cmd_fixdata_xxx.PDB	cmds.pdb	create command descriptors
cmd_fixdata_xxx.PDB cmd_vardata_xxx.PDB	subs.pdb	create command submnemonic descriptors
cmd_verify_xxx.PDB tlpar.pdb disc.pdb cmds.pdb	vers.pdb	create command end-item verifiers
tlpar.pdb loc.pdb disc.pdb tlm_rylim_xxx.PDB tlm_calcurve_xxx.PDB tlm_polyconv_xxx.PDB USER_IVALUE_FILES	ivalue.pdb initial_values_xxx.lst	initial telemetry values

Table A-1. MPS PDB Translator Input and Output Files

or (if analog) the analog raw data value to which the telemetry point will be set. You can print the VERS_xxx.lst file or view it via the PDOS ‘sf’ command.

A.3 MPS PDB Translator Operation

Before running the PDB translator for the first time, make sure that the VME executable file attribute is set. The commands to do this are:

```
cd [root]/DATABASE
sa xpdb, sy
```

> **Note**: VME memory limitations require that the MPS simulator be shut down before the MPS PDB translator can be run. Also, the PDB translator can be executed only from the MVME-177 console.

Then invoke the PDB translator with the following command lines:

```
cd [root]/DATABASE/ver_xxx
../xpdb xxx
```

replacing xxx by the three-digit PDB version number. You will be prompted to enter the version number if you forget it. As part of its initialization, the program displays the following menu:

```
These are the PDB file options:
 You may select one file or all files:

 C = create Command and Submnemonic files
 T = create Telemetry Parameter, Location, and Discrete State
 files
 V = create Command Execution Verification file
 I = create Telemetry Parameter Initial Values file
 A = create ALL PDB files
 X = exit XPDB

 Enter selection:
```

To create the corresponding PDB file, press the letter key for the desired option. You can redisplay this menu at any time the “Enter selection:” prompt is active by pressing just the Enter key. You may select only one option each time the prompt is displayed. You may enter the letter options in either upper or lower case.

The input files shown in Table A-1 must be present in the same directory in order for the conversion process to work. The output files generated will be saved in the same directory.

Warning: If an output PDB file already exists, it will be overwritten.

A.4 MPS PDB Initial Telemetry Values

The PDB Translator creates two files: initial_values_*xxx*.1st and ivalue.pdb, where *xxx* is the version number of the PDB.

initial_values_*xxx*.lst is an ASCII text file that contains the mnemonics and corresponding values (in decimal and hexadecimal) of all the telemetry parameters that will be set to initial values. It may be printed, or viewed on a PC screen by any text editor capable of handling large files.

ivalue.pdb contains the same information in binary form. MPS reads this file during initialization and uses it to set the telemetry parameters.

MPS uses the following criteria for setting telemetry parameters to an initial value:

Stage 1:

Bi-level (one-bit) parameters are set to zero.

Discrete parameters are set to zero.

Analog parameters are set to the midpoints of their ranges:

For unsigned parameters, all bits except the most significant bit are set to 1.

Signed analog parameters are set to zero.

1750A parameters are set to zero.

Stage 2:

The initial values are refined using information extracted from the PDB Red/Yellow limits (rylim) file. For each parameter in the rylim file, the initial value is set to the midpoint between the lower and upper yellow limits. If the limits are in Engineering Units, the midpoint must be converted to a Raw Data Number. If no conversion equation exists for the midpoint, a new value is computed that is the lesser of (1) the lower yellow limit plus 1 and (2) the data point halfway between the lower yellow limit and the midpoint.

Stage 3:

Files of initial values supplied by the user community will be used to supplant or overwrite values computed in Stages 1 and 2.

A.5 Creating User Initial Values File

After completing stages 1 and 2 of initial value processing, the PDB Translator converts files of user supplied initial values. This section explains how to generate the user files.

All user file names must be listed in a file named USER_IVALUE_FILES in the same directory as the PDB source files. The PDB Translator treats each record of USER_IVALUE_FILES as a file name and attempts to open that file. The expected format of each record of USER_IVALUE_FILES is:

- Each record must begin with a valid file name. If the file cannot be found, XPDB prints an error message and continues with the next record.
- Only one filename is allowed per record.
- File names are limited to 31 characters.
- Case is important. The file name in the record must match the filename exactly.
- Trailing comments must be separated from the file name by an vertical bar (|).
- Lines beginning with or consisting only of comments are allowed but may result in warning messages at the MVME-177 console.
- The first blank line (or end of file) causes XPDB to terminate user initial value processing.

The content of each user-supplied file must be as follows:

- Records are either comments or data records.
- Any line beginning with an asterisk (*) is a comment and is ignored.
- Completely blank lines are ignored.
- All input may be in upper or lower case. XPDB converts all characters to upper case before doing any searches or comparisons.
- Data records consist of three fields: telemetry mnemonic, data type indicator, and data value.
- Fields are separated by the vertical bar character (|).
- Spaces may be used for readability.
- A trailing comment may be included in a data record by using a vertical bar to separate it from the data field.
- The data type field is restricted to three 2-character entries. Set the field to EU if the data type is Engineering Units, DN if the data type is raw data number, and TX if discrete state text.
- The data field may contain raw data numbers, floating point ‘f’ format Engineering Unit numbers, or discrete state text. This field’s contents must agree with the data type field.
- Raw Data Numbers may be in Hex, Decimal, or Octal. Hex numbers must be preceded by “0X” and octal numbers must be preceded by 0 (zero). Decimal numbers can start with any decimal digit except zero.
- Discrete state text is limited to 16 characters, the same length as in the tlm_dstate_xxx.PDB file.

- For 1750A parameters, the Type field must be “EU” and the number must be entered in Floating Point ‘f’ format.

The following is an example of the comment format and each of the three types of data record:

```
*
* Filename:  sample_ivalues
* Example user initial value file
*
AST_TR_T_TELESCOP    | EU |  22.025
AST_BR_C_A_ON_OFF    | dn |  0             | Zero means ON!
AST_SR_V_BAND1_GAIN  | TX |  NOR
```

Appendix B – Modeling Data Base Generator for MPS

B.1 Operation

B.1.1 Introduction

This document gives usage instructions for and the formats of the input files for the offline MPS Orbit Modeling database generator, named xmdb. This document does not describe how the online modeling engine works; that information may be obtained from the MPS design document.

For performance reasons, all online telemetry modeling is done in Raw Data Numbers (DN). The offline modeling database generator converts user modeling information to internal format and converts to DN information supplied in Engineering Units (EU).

> **Note**: VME memory limitations require that the MPS simulator be shut down before the modeling data base generator can be run. Also, the modeling data base generator can be executed only from the MVME-177 console.

B.1.2 Usage

You must supply six files to describe the modeling data base completely. Three of these — Algorithms, Table Models, and Telemetry Model Parameters — you create via the input file format instructions given below.

The Telemetry Model Parameters file contains the mnemonics of, and ancillary information for, all of the telemetry parameters to be modeled. The Algorithm file and the Table Model file contain information that xmdb and the online modeling function use to determine new telemetry parameter values.

The input files must be created before xmdb may be invoked. Use any flat ASCII text editor (MS-DOS Editor, Notepad, PC-Write, vi, SimpleText, etc.) to create the files.

Additionally, xmdb requires three other files, which are created elsewhere. The first is tlpar.pdb, the telemetry parameters description file created by the MPS offline Project Database (PDB) Translator, xpdb. The other two are the PDB source files, tlm_calcurve_xxx.PDB and tlm_polyconv_xxx.PDB. (“xxx” stands for the PDB version number.) These three files must be up to date and consistent with each other. The xmdb software uses tlpar.pdb to check the consistency of telemetry parameters supplied. It obtains the conversion types and equation coefficients from the two PDB source files for conversion to DN from EU.

Table B-1 gives the input file name required for each of the three files that you will generate for modeling. The “yyy” in the file names stands for the modeling database version number, assigned by you and distinct from the Project Data Base version number. The modeling database version number, which can be one to three alphanumeric characters and is included as the first record of the output files, has the purpose of ensuring that the correct versions of files are sent to the online modeling task. If modeling database file version numbers do not match, the online modeling task will warn you and will use the files anyway. The corresponding output file names are also shown.

input filename	action performed by xmdb	output filename
mdl_tlm_yyy.inp	create orbit modeling telemetry parameters	mdl_tlm.mdb
mdl_algs_yyy.inp	create algorithms	mdl_algs.mdb
mdl_tables_yyy.inp	create tables	mdl_tbls.mdb

Table B-1. Modeling Data Base Generator Files and File Names

Because of the requirement to share PDB files with the PDB Translator, the Modeling Data Base Generator and its input files must reside in the same directories as the PDB Translator (see Appendix A, Section A.2). The executable xmdb program must be in the DATABASE directory, and the *.inp files must be in the ver_xxx subdirectory of that, where “xxx” is the appropriate version of the PDB. You may place as many sets of modeling input files as you like in each subdirectory; each set must have a distinct modeling data base version number.

Before running the Modeling Data Base Generator for the first time, make sure that the VME executable file attribute is set. The commands to do this are as follows:

```
cd [root]/DATABASE
sa xmdb,sy
```

Then invoke the Modeling Data Base Generator with the following command lines:

```
cd [root]/DATABASE/ver_xxx
../xmdb
```

The xmdb software begins by displaying a greeting that gives its own version number and the current time. This statement has the following format:

"Modeling Database Generator for AM-1, V<current version>, Time: <current time and date>"

Next, xmdb asks you to enter the one- to three-character version number (yyy) of the modeling data base. Then it asks you to enter the version number of the current PDB files.

As xmdb executes, status messages (information, warnings, and errors) appear on the display. These messages are all saved in the file “mdb_yyy.lst” (where yyy is the Modeling Data Base version number). This file is in ASCII format, and you may view or print it with any ASCII text handling software.

In addition, xmdb generates tables of data values when it is computing algorithms in EUs and also when it is converting tables from EUs to raw data units. To give you the option to save these values in ASCII format for viewing or printing, xmdb asks “Do you wish to save values generated by xmdb? [y/n (Default n)]”. To save the values, press the “y” key. (Caution: any previous version of the values in ASCII format will be replaced by the current file.) If you do not want to save the values, press either the “n” key or the “return” key.

B.2 Input File Format

B.2.1. General Information

All records of all files will have the following attributes:

- records are variable length
- record type numbers (see below) must be present for synchronization purposes
- the fields within records are variable length
- fields are separated by the vertical OR-bar (|)
- comment records have an asterisk in column 1
- totally blank records are treated as comments

Some notes about these attributes:

Although there is no restriction on record length, it is a good idea to keep input records short enough to be viewed easily on a computer monitor.

All fields must be present, even if they are unused. Unused fields should contain a zero or a space, depending on their type.

The use of an asterisk to designate comment records allows for a header of indeterminate length, as well as sufficient comments to describe the data adequately.

A field may contain spaces. If it does, proper justification (see below) must be observed.

The table model and telemetry model files each require multiple records to describe an entry.

A description of the field contents follows.

Comment: A comment record contains printable ASCII characters and spaces.

Alpha: An alpha field contains alphanumeric data, including underscores. Entries must be left-justified.

Numeric:	A numeric field contains either integer or floating point numbers. Entries must be right-justified.
Integer:	An integer field contains integer numbers. If the allowed data values are restricted, they will be described in the notes for the appropriate entry.
Float:	The format of a floating point entry is [-]dddd.dddd. (This corresponds to the C-language printf 'f' format.) Use as many decimal and fractional digits as necessary to define the quantity, up to the maximum field size.

The following sections contain detailed descriptions of the file layouts. Notes describe allowed entries, restrictions, and relationships with other fields.

B.2.2 Orbit Modeling

The Orbit Modeling function requires a Telemetry Model Parameter file, a Table Model file, and an Algorithm file.

The Telemetry Model Parameters file is the main, or controlling, file for Orbit Modeling. It contains the names and descriptions of all telemetry parameters to be modeled on an orbit basis. Fields in this file define whether the initial modeling type is to be Static, Table, or Algorithm modeling. Other fields in the Telemetry Model Parameter file identify the particular table or algorithm to be used.

> NOTE
>
> If the conversion equation coefficients of a telemetry parameter are controlled by a switch mnemonic, that switch mnemonic must also be included in the modeling input files, if for no other reason than to provide data values for the offline database generator to use when converting the subject telemetry parameter from EU to DN.

There must be one entry in the Telemetry Model Parameter file for every telemetry parameter to be modeled on an orbit basis. There are two initial modeling type entries, Day Model (sunlight) and Night Model (eclipse). If either of the initial modeling types is Table, there must be an entry in the Table Model file. If either of the initial modeling types is Algorithm, there must be an entry in the Algorithm file.

The Table Model and Algorithm files may contain additional entries. These additional entries, if present, may be used as additional modeling types for any telemetry parameter included in the parameters file. It is also possible to use the same Table Model or Algorithm entry to model multiple telemetry parameters. Although there is no restriction on the use of any table or algorithm with any telemetry point to be modeled, it is advisable to use only those files that have been designed for use with the telemetry point under consideration. See the section on online modeling for more information.

The MPS orbit modeling engine allows each telemetry parameter to be modeled two ways: Night and Day. These designations refer to the spacecraft state of being in or out of solar eclipse. Many telemetry parameters (example: Battery Discharge, Solar Array Current, etc.) have different characteristics depending upon the point of the orbit. e.g. a parameter may be more accurately modeled using a static value during the Night portion of the orbit and as a trigonometric function during the Day portion.

B.2.2.1 Telemetry Model Parameter File

The Telemetry Model Parameter file defines all of the telemetry parameters that can be affected by the Orbit modeling task. It also describes, through pointers into the Table Model and Algorithm files, the way(s) in which the telemetry parameters may be affected.

A combination of four types of records are necessary to describe a telemetry parameter. There must be one of each record for every parameter.

Record type #1:

field number	field name	field type	maximum field width (bytes)
1	record type	Integer	1
2	telemetry mnemonic name	Alpha	22
3	noise status	Alpha	1
4	update interval	Integer	3
5	storage type	Alpha	1

Table B-2. Telemetry Model Parameter File Format, Record Type 1

Notes: 1. Field 1 must contain the number 1.

2. The telemetry mnemonic name must be identical to the telemetry mnemonic in the Project Data Base (PDB).

3. Gaussian Noise modeling. Allowable values are Y and N.

   If noise modeling is turned on, a random number is calculated at each update and added to the new data value. This number is conditioned to be within certain limits through the use of a mathematical function. The standard deviation (see record type 3, field 4) is used as a fractional multiplier to further restrict the noise value.

4. This field is defined as the number of seconds between updates. The allowable values are 1 to 999.

5. This field signals the database generator to convert the data values in records 2 and 3 to Raw Data from Engineering Units. The allowable values for this field are “R” (leave as raw) and “E” (convert to EU).

Record Type #2 — Day Model fields:

field number	field name	field type	maximum field width (bytes)
1	record type	Integer	1
2	initial Day Model type	Alpha	4
3	DN/EU indicator	Alpha	2
4	Day static value	Float	19
5	Day table/alg. name	Alpha	30

Table B-3. Telemetry Model Parameter File Format, Record Type 2

Record Type #3 — Night Model fields:

field number	field name	field type	maximum field width (bytes)
1	record type	Integer	1
2	initial Night Model type	Alpha	4
3	DN/EU indicator	Alpha	2
4	Night static value	Float	19
5	Night table/alg. name	Alpha	30

Table B-4. Telemetry Model Parameter File Format, Record Type 3

The following notes apply to record types 2 and 3:

1. Field 1 must contain the number 2 or 3, as appropriate.
2. The allowable values for field 2 are 'STAT' for Static, "TBL' for Table, and 'ALG' for Algorithm.

   If field 2 is "STAT" then field 4 contains the static value and field 5 should contain a single ASCII space.

If field 2 is "TBL" or "ALG" then field 4 should contain a single ASCII zero and field 5 must contain the Table or Algorithm name, as appropriate. This name must match the contents of field 2 of the record in the Table Model or Algorithm file.

3. Field 3 must contain either of the ASCII strings “DN” or “EU”. “EU” indicates that the static value in field 4 must be converted from Engineering Units to Raw Data Numbers.

Record type #4:

field number	field name	field type	maximum field width (bytes)
1	record type	Integer	1
2	minimum value usage flag	ASCII	1
3	DN/EU indicator	ASCII	2
4	minimum	Float	19
5	maximum value usage flag	ASCII	1
6	DN/EU indicator	ASCII	2
7	maximum	Float	19
8	standard deviation	Float	6

Table B-5. Telemetry Model Parameter File Format, Record Type 4

Notes: 1. Field 1 must contain the number 4.

2. Fields 2 and 5 contain usage flags indicating whether the minimum and maximum allowed data values are to be used by the online modeling task. A value of “T” indicates that modeling is to test for the current value exceeding the minimum (or maximum) limit. A value of “N” means don’t test.

3. Fields 3 and 6 contain conversion indicators for the minimum and maximum allowed data values, respectively. If the field contains “EU”, this indicates that the respective value is in Engineering Units and must be converted to DN. A value of “DN” means that the data value is not to be converted.

4. Fields 4 and 7 contain the minimum and maximum allowed data values, respectively. If a field is unused, it must contain a single zero.

5. When the addition of Gaussian noise is enabled in the online modeling task, the standard deviation (Field 8) is used as a fractional multiplier. The entry is interpreted as a percent. The allowable values are 0.0001 to 99.999. If this is unused, Field 8 should contain a single zero. (A single zero is interpreted as a divisor of one.)

Example: A telemetry parameter description for Orbit modeling.

1|TLM_1 |Y| 5

2|TBL | 0| |TABL_1

3|STAT |EU| 2.005

4|N| |0|U|EU| 100.0| 0.05

This example shows that telemetry point TLM_1 has:

(in record 1)	Gaussian noise modeling enabled
	an update every 5 seconds
	maintains the data as Raw telemetry values
(in record 2)	TABL_1 is used for Day modeling; the Static Modeling fields are blank
(in record 3)	Night Modeling is via a static value in Engineering Units (it must be converted)
(in record 4)	there is no lower data value limit
	the high data value limit is 100.0
	the standard deviation is 0.0005

B.2.2.2 Algorithm File

The entries of the Algorithm file are used to define the characteristics of the algorithms used to model telemetry parameters. In algorithm modeling, a mathematical equation is used to define the behavior of the telemetry point as time passes. The allowed algorithm modeling equations are sine, cosine, exponential, and ramp. The format of the equations is as follows:

SIN = a + b * sin (c * t)

COS = a + b * cos (c * t)

EXP = a + (b * exp (c * t))

RAMP = a + (b * t)

where t is time in seconds since the beginning of the orbit.

The Sine and Cosine functions are calculated in radians. If the coefficient C is on the order of 2π radians, these functions will cycle through all possible values approximately once every six seconds. To make the cycle slower, C must contain an appropriate divisor.

When the Exponential function is used, C must be kept quite small to keep the conversion process from becoming compute-bound. If the function is being entered in EU, a suggested starting point for C is 0.001. If the function is being entered in Raw Data, choose C such that the following equation is satisfied:

$$2^{**}(k-1) < \exp(c * 5940)$$

where ** indicates "to the power of" and k is the telemetry parameter size in bits.

Each algorithm has one record in the data base. This record has the following structure:

field number	field name	field type	maximum field width (bytes)
1	telemetry mnemonic	Alpha	22
2	algorithm name	Alpha	30
3	algorithm type	Alpha	4
4	DN/EU indicator	Alpha	2
5	coefficient A	Float	19
6	coefficient B	Float	19
7	coefficient C	Float	19

Table B-6. Algorithm File Format

Notes:

1. Field 1 must contain the telemetry mnemonic with which this algorithm is initially associated. Since only one record is required, the record type field is unnecessary and has been omitted.
2. The allowable entries for field 3 are 'SIN', 'COS', 'EXP', & 'RAMP'.
3. The allowable entries for field 4 are "EU" and "DN". If "EU" is entered, the generator must work the equation for one orbit's worth of data using the coefficients given, then convert the results to Raw Data Numbers. If it is "DN", no conversion is needed.
4. Field 5 contains coefficient A of the mathematical equation, field 6 contains coefficient B, and field 7 contains coefficient C.

Coefficient C is not used for the RAMP model. It may either be set to zero or be omitted.

Example:

TLM_1 |ALG_1 |SIN |EU| 1.0| 2.0| 3.0

defines the algorithm ALG_1 as being of type sine associated with telemetry point TLM_1 and defines the equation as being

$y = 1.0 + 2.0 * \sin(3.0 * t)$ in EU.

B.2.2.3 Table Model File

The entries of the Table Model file are used to define the characteristics of the tables used to model telemetry parameters. Two types of records are necessary to describe a table model: one copy of record type 1, and as many iterations of record type 2 as there are data points, as defined by field 4 of record 1 (length.)

The Table modeling software of the online modeling function performs an update once per second. If there is no table entry for the exact time of the update, the software interpolates between the nearest two data points. Furthermore, it will extrapolate to data values before the beginning and after the end of the table if necessary. Thus, it is not necessary to create every table to cover an entire orbit for every telemetry parameter. However, every table must have at least two data points.

Record type #1: table header

field number	field name	field type	maximum field width (bytes)
1	record type	Integer	1
2	table name	Alpha	30
3	telemetry parameter	Alpha	22
4	length	Integer	4
5	DN/EU indicator	Alpha	2

Table B-7. Table Model File Format, Record Type 1

Notes:

1. Field 1 must contain the number 1.
2. Field 4 is the number of data points (the number of type 2 records) that follow. Values allowed are 1 to 9999.

3. The allowable values in field 5 are “EU” and “DN”. If field 5 contains the string “EU”, all of the type 2 records that follow are assumed to contain values in EU, which must be converted.

Record type #2: data values

field number	field name	field type	maximum field width (bytes)
1	record type	Integer	1
2	time	Integer	10
3	data	Float	19

Table B-8. Table Model File Format, Record Type 2

There must be one type 2 record for each data point.

Notes: 1. Field 1 must contain the number 2.

2. Field 2 contains the time, in seconds, since the beginning of the orbit. The contents of this field are unsigned and must be 0 to 5940. (Do not enter commas.)

3. The data value in field 3 must match the storage type (Raw Data or Engineering Units) identified in field 5 of the table descriptor record (Type 1.)

Example:

```
1|TABL_1  |TLM_2|3|DN
2|       0| 10
2|  1100|  25
2|  1500|  26
2|  1700|  31
```

This example defines table TABL_1 as having four data points that are already in Raw Data Numbers. It is initially associated with telemetry point TLM_2.

B.3 Messages

All of the informational, warning, and error messages produced by xmdb are reproduced below. Most of the messages are self-explanatory. An explanation is provided in italics wherever it was felt that more information is necessary. Some of the messages are displayed in multiple lines to ensure that telemetry mnemonics and table or algorithm names appear on the screen. The second and succeeding lines of multi-line messages are indented. Text within angle brackets (“< >“) describes the contents of a variable field that is filled in with data when the message is generated.

The messages are listed here in alphabetical order to facilitate locating a message. The bold letter before each message designates the severity of the message, as follows:

- **F** Fatal Error. xmdb will quit.
- **E** Severe Error. The parameter, algorithm, or table will be dropped, but xmdb will not quit.
- **W** Warning. Disallowed value in input record. The parameter, algorithm, or table may be dropped.
- **I** Informational.

I <table name> | <tlm mnemonic> | <length>

First entry in mdl_tables_yyy.lst for a table being converted from EU to DN or being generated in EU from an algorithm.

I <time> <value in EU> => <value in DN>

Data entry in mdl_tables_yyy.lst for a table being converted from EU to DN.

I <time> <EU value>

Data entry in mdl_tables_yyy.lst for a table being generated in EU from an algorithm.

I All data values generated were saved in mdb_tables.lst

I All data values generated will be saved in mdb_tables.lst

I All msgs were saved in <filename>

I All msgs will be saved in <filename>

I Algorithms database created.
Read <n> records; wrote <m> algorithms; created <k> EU tables

I (birge_vieta) Evaluated value of polynomial = <interim value>

W (birge_vieta) non-convergence\f(x) = <original value>
f'(x) = <interim value>

I Calibration curve file read complete. Read <n> records.
Discarded <k> records.

E Cannot convert table <table name> for mnemonic <tlm mnemonic> to Raw Data
There are NO coefficients in tlm_calcurve!

E Cannot convert maximum for <tlm mnemonic> to DN
Mnemonic has NO coefficients in tlm_calcurve

E Cannot convert minimum for <tlm mnemonic> to DN
Mnemonic has NO coefficients in tlm_calcurve

I Converted tables being saved in print file.

I Converting max and min limits to EU for <tlm mnemonic>

I Converting table <table name> to raw data

F Could not allocate enough memory for telemetry coefficients

F Could not calloc memory in md_convert_to_raw

F Could not open input file <tlm param filename> of telemetry nodes to model.

W Could not open the statistics print file

I Could not open the table output save file

E Could not open <table filename>

I Data values being saved in print file.

This message indicates that the operator has requested saving of internally generated EU and DN values in the mdl_tables_yyy.lst file.

I <k> data points converted

I End table input; read <n> tables from a total of <k> records

W Error: invalid record type (valid record types are 1 or 2)

<input echoed here>

The table record read has an illegal value in the record type field.

E Error: day model type must be STAT, TBL, or ALG
<input echoed here>

The telemetry parameter has been dropped.

There is a corresponding Night Model message.

E Error in noise status field:
<input echoed here>

The noise status field of a type 1 telemetry record contained a character other than 'Y' or 'N'

W (eux_polynomial_f) Floating point value overflow

During EU to DN conversion the intermediate result became too large to fit into a long double variable. This indicates non-convergence.

E (eux_polynomial_f) NULL coefficient list

No coefficients were supplied for an EU to DN conversion.

W For the mnemonic <tlm mnemonic> at time <time>
no switch node limits bracket the current data value (<value in EU>)
Data value being set to zero.

I For tlm param <tlm mnemonic>,
converted day model static value is <value>(DN)

I For tlm param <tlm mnemonic>,
converted night model static value is <value> (DN)

These two messages go into mdl_tables_yyy.lst if the operator has requested saving of messages.

E Group number (<n>) for mnemonic not in poly equation list. <tlm mnemonic> discarded

The record read from tlm_calcurve_xxx.PDB has an equation number that was not in tlm_polyconv_xxx.PDB.

E Illegal entry in DN/EU indicator field:
<input echoed here>
Algorithm Dropped

E Illegal or unrecognizable input in maximum limit DN/EU indicator
<input echoed here>
Telemetry node dropped

The EU to DN conversion indicator for the maximum value of a type 4 telemetry record contains unrecognizable information.

W Illegal or unrecognizable input in maximum value usage flag
<input echoed here>

The maximum value usage flag field of a type 4 telemetry record has unrecognizable contents. The maximum value will not be tested online.

E Illegal or unrecognizable input in minimum limit DN/EU indicator
<input echoed here>
Telemetry node dropped

The EU to DN conversion indicator for the minimum value of a type 4 telemetry record contains unrecognizable information.

W Illegal or unrecognizable input in minimum value usage flag
<input echode here>

The minimum value usage flag field of a type 4 telemetry record has unrecognizable contents. The minimum value will not be tested online.

I Input and conversion complete; writing output files

W Input eu /<EU value>/ can't extrapolate the raw value

W Input value /<EU value>/ outside calibration curve,
polynomial degenerates to a constant (<EU value>)

E md_alg: Could not open <filename>

W Mnemonic <tlm mnemonic> has no roots for value <EU value>
Value will be set to zero.

E Mnemonic <tlm mnemonic>
associated with Algorithm <algorithm_name>
is not in models database!
Algorithm Dropped.

I Modeling Database Generator for AM-1, V<version number>, Time: <current time & date>

W Modeling Database Version must be 1-3 alphanumerics.

E None or too many coefficients available (<# coeffs>)

E No tlm node for calcurve mnemonic <tlm mnemonic>; record discarded.

A record has been read from the tlm_calcurve_xxx.PDB file which has no corresponding entry in the PDB file generated from tlm_parm_xxx.PDB.

W PDB Version must be 1-3 alphanumerics.

I Please enter the Modeling Database version number:

I Please enter the PDB version number:

W Polynomial degenerates to a constant (<EU value>)
for any raw telemetry value

E Premature ending of algorithm input line; algorithm dropped
<input echoed here>

E Premature ending of table record type 1; table dropped!
<input echoed here>

W Premature ending of table record type 2; data point dropped!
<input echoed here>

E Premature ending of tlm rec type 1; tlm node dropped

<input echoed here>

E Premature ending of tlm rec type 2; tlm node dropped

<input echoed here>

E Premature ending of tlm rec type 3; tlm node dropped

<input echoed here>

E Premature ending of tlm rec type 4; tlm node dropped

<input echoed here>

W Previous table had no type 2 records

I Processing the algorithms file (<filename>)

E Ran out of memory in md_work during table allocation

The algorithm will not be converted to DN

E Ran out of memory in md_work during data area allocation

The algorithm will not be converted to DN

F Ran out of memory while allocating algorithm space

F Ran out of memory while allocating switch mnemonic nodes.

E Ran out of memory while allocating table data space.

E Ran out of memory while allocating tlm models

E Ran out of memory while getting a switch node in md_tlm4

The telemetry record has been dropped.

E Ran out of memory while getting table header space.

I Reading and converting the file of telemetry nodes to model (<tlm param filename>)

I Reading in PDB telemetry records

I Reading Modeling Database Version <n> and PDB Version <k>

I Reading polynomial conversion coefficients from tlm_polyconv_xxx.PDB

I Reading the calibration curve file, tlm_calcurve_xxx.PDB

I Reading the table models file (<table filename>)

I Read <n> TLM node records

<n> is the number of telemetry parameters in the PDB

W Standard deviation for mnemonic <tlm mnemonic> is out of limits
Standard deviation will be set to zero

I Table <table name>
being generated in EU values from Algorithm <algorithm name>
for mnemonic <tlm mnemonic>

W Table <table name> had no type 2 records

W Table <table name> had too many or too few type 2 records

E Telemetry model record for <tlm mnemonic> does not exist. Table dropped.

I Telemetry parameter model file read complete
<n> records read, <k> nodes created.

I The Polynomial Conversion Coefficient file contains <n> records

I The three output file names are: mdl_tlm.mdb, mdl_algs.mdb, & mdl_tbls.mdb

E Tlm node <tlm mnemonic> requested to model - not in PDB! Node dropped.

E TLM node for mnem <tlm mnemonic> does not exist. Cannot convert EU to Raw

The telemetry node has been dropped.

E Tlm param: <tlm mnemonic>
Could not find a switch mnemonic value to match the value entered
Cannot convert Day Model Static Value to Raw Data Numbers
Tlm node dropped.

Note: There is a corresponding Night Model Static Value message.

I TLM param <tlm mnemonic> has switch mnemonic <tlm mnemonic>

E TLM param <tlm mnemonic> (taken from table <name>

Does not have a matching tlm node! Table not converted.

E TLM point to model <tlm mnemonic> has multiple switch mnemonics:
(<mnemonic1> and <mnemonic2>);
XMDB cannot handle this condition. <mnemonic2> discarded

F Unable to allocate memory for telemetry nodes.

F Unable to open file (mdl_tlm.mdb) to write telemetry nodes to model!

F Unable to open file (mdl_algs.mdb) to write algorithms!

F Unable to open file (mdl_tbls.mdb) to write tables!

If any of these three messages are seen, the telemetry parameter, algorithm, AND table model files will NOT be written to disk.

F Unable to open Poly Conversion Coefficients file, tlm_polyconv_xxx.PDB

F Unable to open telemetry file, tlpar.pdb

F Unable to open the Calibration Curve file, tlm_calcurve_xxx.PDB

W Unexpected record type (<n>) on input:
<input echoed here>
expected: <k>

E Unknown conversion type for mnemonic <tlm mnemonic>; record discarded

The record read from tlm_calcurve_xxx.PDB has a conversion type other than U_3D, U_5D, and U_EXP.

W Unknown record type on input:
<input echoed here>
expected: <k>

E Unrecognizable data in algorithm type field:
<input echoed here>
Algorithm Dropped.

W Unrecognizable data in table rec type 1 DN/EU field
<input echoed here>
Will assume no conversion necessary.

E Unrecognized input in DN/EU indicator field
<input echoed here>

The EU to DN conversion indicator of a type 2 or 3 telemetry record contains an unknown value. The telemetry node has been dropped.

W WARNING:
Converted min/max values overlap in nodes of switch mnemonic <tlm switch mnem>
Model data conversion from EU to raw may not be accurate!

E Warning - TLM node <tlm mnemonic> has no conversion coefficients
Can only model in Raw Data Numbers

There was no entry in tlm_calcurve_xxx.PDB for this telemetry mnemonic. The telemetry node has been dropped.

I Wrote <n> telemetry nodes to model
Wrote <k> algorithms and <m> tables

xmdb has completed successfully. These are the counts of telemetry parameters, algorithms, and tables available to the online modeling task.

I XMDB generates tables of data values when working algorithms
in Engineering Units, and when converting tables from Engineering
Units to Raw Data Numbers. These values can be saved in an
ASCII print file for visual inspection.
Do you wish to save data values generated by XMDB? [y/n (Default n)]:

Appendix C – User Commands

C.1 Introduction

MPS accepts two types of user commands. One type works directly on the telemetry and can set telemetry header fields, change the telemetry rate, or set values for specific telemetry parameters. The other type lets you enter specific spacecraft commands.

User commands are not case sensitive.

C.2 Telemetry Type User Commands

Table C-1 shows the user commands that work directly on the telemetry.

Name	Meaning and Effect
u_rserror1_on	Turns on Reed-Solomon error control for EDUs transmitted on Channel 1 (sets to 1 the R/S flag, item 17, in the EDOS Service Header)
u_rserror2_on	Turns on Reed-Solomon error control for EDUs transmitted on Channel 2
u_rserror1_off	Turns off Reed-Solomon error control for EDUs transmitted on Channel 1 (sets to 0 the R/S flag)
u_rserror2_off	Turns off Reed-Solomon error control for EDUs transmitted on Channel 2
u_rate1_1k	Sets the data rate on channel 1 to 1000 bps (EDOS sim mode only)
u_rate1_16k	Sets the data rate on channel 1 to 16000 bps (EDOS sim mode only)
u_rate1_32k	Sets the data rate on channel 1 to 32000 bps (EDOS sim mode only)
u_rate2_1k	Sets the data rate on channel 2 to 1000 bps (EDOS sim mode only)
u_rate2_16k	Sets the data rate on channel 2 to 16000 bps (EDOS sim mode only)
u_rate2_32k	Sets the data rate on channel 2 to 32000 bps (EDOS sim mode only)
u_pbvcid_1	Sets the VCID to 1 (in the EDOS Service Header)
u_pbvcid_11	Sets the VCID to 11 (hexadecimal “B”)
u_setreplay_on	Turns on replay (sets the replay flag to 1 in the VCDU header)
u_setreplay_off	Turns off replay (sets the replay flag to 0 in the VCDU header)
u_set1750	Allows you to set 1750A data points in the telemetry stream.

Table C-1 Telemetry-Type User Commands

All telemetry-type commands except u_set1750 use only the command name, with no arguments. The following paragraphs present the syntax and semantics of the u_set1750 command.

Syntax: u_set1750, <parameter name>, <value>

where

<parameter name> is the mnemonic name of the 1750A telemetry parameter whose value is to be assigned

<value> is the value to be assigned to that parameter

You may include spaces before an argument, but not before a comma.

The value must be an integer or real number in either decimal or scientific notation. Specifically, <value> is of the form [sign] <d> [(d)][.][(d)][e|E[sign]d[d[d]]], where “sign” is a plus or minus sign, “d” is a decimal digit, and “e” and “E” are the lower- and upper-case letter “e.” Components in brackets are optional; those in parentheses may be repeated zero or more times.

C.3 Command Type User Commands

The other type of user command enables you to enter spacecraft commands:

CMD:[spacecraft command] — Builds the specified spacecraft command.

The CMD user command has two formats:

- CMD:<mnemonic> — any valid spacecraft command mnemonic from the project data base (PDB). When this format is entered, MPS constructs the command with default values for any variables. If you enter an invalid mnemonic, the error message “Unknown command [mnemonic] entered” appears in the status log area of the main MPS window. The angle brackets are required for this format.
- CMD:xxxx,xxxx,...,xxxx — four-digit hexadecimal numbers representing the Destination, the Descriptor, and zero to eight data words. (Commas and leading zeroes are required.) If you enter incorrect syntax, the error message “Format mismatch in user command” appears in the status log area of the MPS main window. If MPS cannot match your specified Destination and Descriptor to any commands in the PDB, the error message “Command UNKNOWN [xxxx,xxxx] received” appears in the status log area.

Appendix D – Scenario File Converter

D.1 Introduction

The Scenario File Converter utility, referred to as xscn, converts MPS scenario files from a user-friendly input format to the format expected by the MPS GUI. xscn has the following capabilities:

- converting numbers in Engineering Units (EU) to Raw Data Numbers (DN)
- accepting DN input in Hex, Decimal, and Octal and converting it to Decimal
- accepting Discrete State Text and locating the text in the telemetry node to get the corresponding DN number

xscn runs on the MPS MVME-177 so that it can take advantage of the Project Data Base (PDB) files created by xpdb, the PDB Translator utility (which converts PDB source files into a format readable by MPS). Section D.2 gives instructions on how to run xscn, Section D.3 describes the input file record formats, and Section D.4 details the capabilities and limitations of xscn.

xscn is best used within a directory structure like that shown below, where the PDB source and translated files are in subdirectories “ver_14”, etc.:

```
[root] /ACPT
       /PDB14
       /PDB15
       /DATABASE /ver_14
                 /ver_15
```

xscn should reside in the DATABASE directory so that it may be run from any subdirectory. The following preconditions must be met:

- xscn requires translated PDB files. The PDB Translator, xpdb, must be run first (at some time in the past) so that a consistent set of PDB files are present. Instructions for running xpdb are contained in Appendix A.
- xscn also requires the PDB source files tlm_calcurve_xxx.PDB and tlm_polyconv_xxx.PDB, where xxx is the version identifier of the PDB.

> **Note**: VME memory limitations require that the MPS simulator be shut down before the scenario file converter utility can be run. Also, this utility can be executed only from the MVME-177 console.

D.2 Using xscn

Before running xscn, create the scenario source files using any text editor. See Section D.3 for instructions on creating scenario source files.

After creating the scenario source file(s), place them in the MPS MVME-177 subdirectory containing the desired PDB version (/DATABASE /ver_14, for example.) If another computer was used to create the source files, use ftp in ASCII mode to copy them to the MVME-177.

Next, from the MVME-177 console, change your directory ("cd") to the subdirectory containing the scenario source files. Invoke xscn, which is in the parent directory, by entering

```
../xscn
```

xscn first asks for the PDB version number. This is the last one-to-three characters of the PDB source file names. For example, if PDB version 14 is being used, the PDB file names are like "tlm_polyconv_014.PDB" and "014" should be entered.

As it runs, xscn prints informational and error messages to the MVME-177 console. Every message sent to the console is saved in an ASCII disk file named SCN_MESSAGES.LST.

Because of reused code, some warning messages may not be sent to the console. ALL warning messages are saved in the SCN_MESSAGES.LST file.

After xscn terminates, SCN_MESSAGES.LST may be viewed via the "sf" command, or printed.

xscn initializes local copies of the telemetry parameter nodes. This involves reading in certain translated PDB files as well as the source files tlm_polyconv_xxx.PDB and tlm_calcurve_xxx.PDB. Initialization takes approximately two minutes. A number of informational messages will be printed during this time.

After initialization is complete, xscn begins prompting for scenario source file names. Every time the prompt appears, enter one file name exactly as it appears in the directory. When xscn receives a valid file name it processes that file, creating an output file named from the input file name with the extension ".scn" added. The length of input file names is limited to 27 characters. After completely converting the file, xscn asks for another file name.

To exit, press the Return key in response to the file name prompt. To keep you from accidentally exiting xscn before you want to, xscn prompts you to press Return again if you really want to exit, or enter a file name if you don't.

Additionally, if you misspell a file name, xscn displays a message informing you that it could not find the file, and it prompts for another file name. If you notice a misspelling before pressing the Return key, use the BACKSPACE or PRINT key to erase the incorrect character(s), then retype the name.

After the file translation is complete, use ftp in ASCII mode to copy the output file(s) to the desired directory on the MVME-187 computer.

D.3 Source File Format

xscn accepts three source record types.

Comment Record

Comment records either begin with an asterisk (these may contain any ASCII characters) or are completely blank. Comment records are not passed to the output file.

Data Record 1

Data record 1 is the main record. It resembles the original format scenario file record but with the addition of “data type” and optional comment fields and a vertical bar. The format of this record is:

<time><space><mnemonic><comma><data type><bar><value>{<space{<bar><comment>}>}

- data type is the ASCII characters DN, EU, or TX
- the data value must be separated from the type field by a vertical bar (|)
- everything within the curly brackets ({}) is optional comment. Leading spaces are optional. The comment text must be preceded by a vertical bar. The curly brackets are for illustration purposes and are not part of the syntax.
- if the data type is TX, the telemetry point must be Discrete type and the data value is expected to be ASCII text that matches the text of one of the discrete records in tlm_dstate_xxx.PDB for that telemetry point, except for case. If no matching text is found, an error message is displayed and the input record is discarded.
- if the data type is EU, the data value is expected to be in floating point ‘f’ format. Examples: 2.25, 1.25e10.
- if the data type is DN, the Raw data value may be in Hex, Decimal, or Octal. Hex numbers must be preceded by “0X” whereas octal numbers must be preceded by “0” (zero). Decimal numbers may begin with any decimal digit except zero.

Any errors detected will cause an explanatory message to be sent to the operator, and the input record will be discarded.

Examples of all three types of Data Record 1 follow:

```
000:00:00:00 AST_SR_V_PTG_ANGLE,EU|28.5      | optional comment
000:00:00:05 com_ir_cxt_swtch,TX|Enabled
000:00:00:10 GNC_SR_ST_HKRY1, DN|0x2A
```

Data Record 2: Original Format

It has been recognized that users may want to enhance existing scenario files without reformatting all of the records of the original file. An “original format” record has the following layout:

<time><space><mnemonic><comma><value>

This record format is identical to that originally designed for scenario files to be processed directly by the MPS GUI, and is identical to xscn output records. The data value must be decimal. When xscn detects a record with this format, it converts all lower case letters to upper case, then passes the record to the output file without further processing.

D.4 Capabilities and Limitations

Capabilities

All input may be in upper, lower, or mixed case. xscn converts lower case characters to upper case before converting the record for output.

xscn can convert multiple input files at each invocation. Enter one file name each time the prompt appears.

xscn includes a comment record facility similar to that of the User Initial Values File facility of the PDB Translator (see Section A.5).

As it runs, xscn copies all error and informational messages to a message file. The name of this file is “SCN_MESSAGES.LST”.

Limitations

xscn depends heavily on code reused from the PDB Translator and the Modeling Database Generator. For this reason, you should check the message file after running xscn, as some error messages may not be displayed to the monitor screen.

Because xscn appends the characters “.scn” to the input file name, file names are limited to 27 characters.

xscn cannot convert data values for 1750A parameters. This is because the MPS GUI scenario file processing sends data values to the MPS via the Telemetry Packet Configuration logic. 1750A parameter values can be changed only via User Command (see Section C.1).

Appendix E – MPS EU to Raw Data Converter

E.1 Introduction

The Engineering Unit (EU) to Raw Data Conversion utility, referred to as xdcu, accepts EU numbers in floating point format from the MVME-177 console and returns the corresponding Raw Data Number in decimal and Hex. xdcu runs on the MPS MVME-177 so that it can take advantage of the Project Data Base (PDB) files created by xpdb, the PDB Translator utility. (xpdb converts PDB source files into a format readable by the MPS; see Appendix A.)

Section E.2 gives the xdcu operating instructions, and Section E.3 describes limitations.

xdcu is best used within a directory structure like that shown below, where the PDB source and translated files are in subdirectories "ver_14", etc.

```
[root]    /ACPT
          /PDB14
          /PDB15
          /DATABASE /ver_14
                    /ver_15
```

xdcu should reside in the DATABASE directory so that it may be run from any subdirectory. The following preconditions must be met:

- xdcu requires translated PDB files. The PDB Translator, xpdb, must be run first (at any time beforehand) so that a consistent set of PDB files is present. (See Appendix A.)
- xdcu also requires the PDB source files tlm_calcurve_xxx.PDB and tlm_polyconv_xxx.PDB, where xxx is the version identifier of the PDB.

> **Note**: VME memory limitations require that the MPS simulator be shut down before the EU to Raw Data Conversion utility can be run. Also, this utility can be executed only from the MVME-177 console.

E.2 Operation

From the MVME-177 console, change the directory ("cd") to the subdirectory containing the desired version of the translated and source PDB files. Invoke xdcu, which is in the parent directory, by entering

```
../xdcu
```

xdcu will first ask for the PDB version number. This is the last one-to-three characters of the PDB source filenames — i.e., if PDB version 14 is being used, the PDB filenames will be like "tlm_polyconv_014.PDB" and "014" should be entered.

As it runs, xdcu prints informational and error messages to the MVME-177 console. Every message sent to the console is saved in an ASCII disk file named RAW_NUMBERS.LST.

> Because of reused code, some warning messages may not be sent to the console. ALL warning messages are saved in the RAW_NUMBERS.LST file.

After xdcu terminates, you may print the RAW_NUMBERS.LST file or view it via the "sf" command.

xdcu initializes local copies of the telemetry parameter nodes. This involves reading in certain translated PDB files as well as the source files tlm_polyconv_xxx.PDB and tlm_calcurve_xxx.PDB. Initialization takes approximately two minutes. A number of informational messages will be printed during this time.

After initialization is complete xdcu begins prompting for operator entry. Each entry consists of a telemetry mnemonic and one or more EU values. You may enter a single value to be converted, or a number of values separated by commas. You may also request that xdcu convert a range of values by entering a lower and upper bound separated by the "greater than" (>) symbol. The general syntax of the entries expected by xdcu is shown below. The colon after the mnemonic is required, as are the commas when more than one value is entered, and the "greater than" symbol when a range is entered. Spaces may be entered between the mnemonic and value and between values to improve readability.

```
mnemonic: value, value, value, ...     (up to 80 characters per line)
mnemonic: low value > high value
```

All EU values and their corresponding Raw Data Numbers are copied to RAW_NUMBERS.LST, as well as being displayed on the console.

To exit from xdcu, press the Return key twice in response to the prompt.

E.3 Capabilities and Limitations

Capabilities

xdcu converts telemetry data values from EU to Raw Data Numbers. It prints its results in Decimal and Hexadecimal. The MPS GUI scenario file processor (not the off-line utility, xscn) requires its input in decimal whereas the Telemetry Packet Configuration screen requires its input in Hex.

All input may be in upper or lower case. xdcu converts all lower case letters to upper case before parsing the entry.

When converting a range of numbers, xdcu converts the lower and upper bounds entered by the operator, then calculates the EU values corresponding to all of the raw numbers between the two results obtained. This speeds the calculation of a large range of values.

Limitations

xdcu depends heavily on code reused from the PDB Translator and the Modeling Database Generator. For this reason, it is recommended that the message file, RAW_NUMBERS.LST, be checked after running xdcu as some error messages may not be displayed to the monitor screen.

When converting a single number, xdcu rounds the result to the nearest integer. If you desire to know the exact EU value corresponding to a raw data value, use the range mode of xdcu, giving it endpoints that bracket the desired value.

If the mnemonic entered is Discrete type, EU to raw data conversion does not apply. xdcu will advise you to look into the tlm_dstate_xxx.PDB source file.

Because of code reuse, a limited 1750A parameter value conversion capability has been included. xdcu converts floating point numbers to 1750A format and prints the result in hexadecimal. It does not handle a range of values. If a range is requested, the endpoints (only) will be converted.

Abbreviations and Acronyms

APID	application process identifier
ASCII	American Standard Code for Information Interchange
BER	bit error rate
C&DH	command and data handling
CADU	Channel Access Data Unit
CCSDS	Consultative Committee for Space Data Systems
CLCW	command link control word
cmd	command
CODA	Customer Operations Data Accounting
COP	command operations procedure
CRC	cyclic redundancy check
DRAM	dynamic random-access memory
DSN	Deep Space Network
EBnet	EOSDIS Backbone Network
EDOS	EOS Data and Operations System
EDU	EDOS Data Unit
EGS	EOS Ground System
EOC	EOS Operations Center
EOS	Earth Observing System
EOSDIS	Earth Observing System Data and Information System
ESDIS	Earth Sciences Data and Information System
ESH	EDOS Service Header
ETS	EOSDIS Test System
FOT	Flight Operations Team
FSIO	Frame Synchronization I/O
FTP	file transfer protocol

GN	Ground Network
GSFC	Goddard Space Flight Center
GUI	graphical user interface
ICD	Interface Control Document
ICW	input control word
HK	housekeeping
HSIO	High Speed Input/Output
LAN	local-area network
LRS	Low-Rate System (ETS)
MPS	Multimode Portable Simulator (ETS)
MVME	Motorola Versa Modular Eurocard
OCW	output control word
OMD	Operations Management Data
OMDSIM	Operations Management Data Simulator
OSF	Open Software Foundation
PDB	project data base
PSS	portable spacecraft simulator
RB	rate buffered
RISC	reduced-instruction-set computing
RT	remote terminal
SCS	Spacecraft Contact Session
SN	Space Network
TBD	to be determined
TDRSS	Tracking and Data Relay Satelite System
tlm	telemetry
UTC	Universal Time Coordinated
VCDU	Virtual Channel Data Unit
VCID	Virtual Channel Identifier
VME	Versa Module Eurocard

WGS	Wallops Ground System
xmdb	Orbit Modeling Database Generator
xpdb	Project Data Base Translator
xscn	Scenario File Converter

Index